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CP/M 2.2.1 on the ONYX C8001

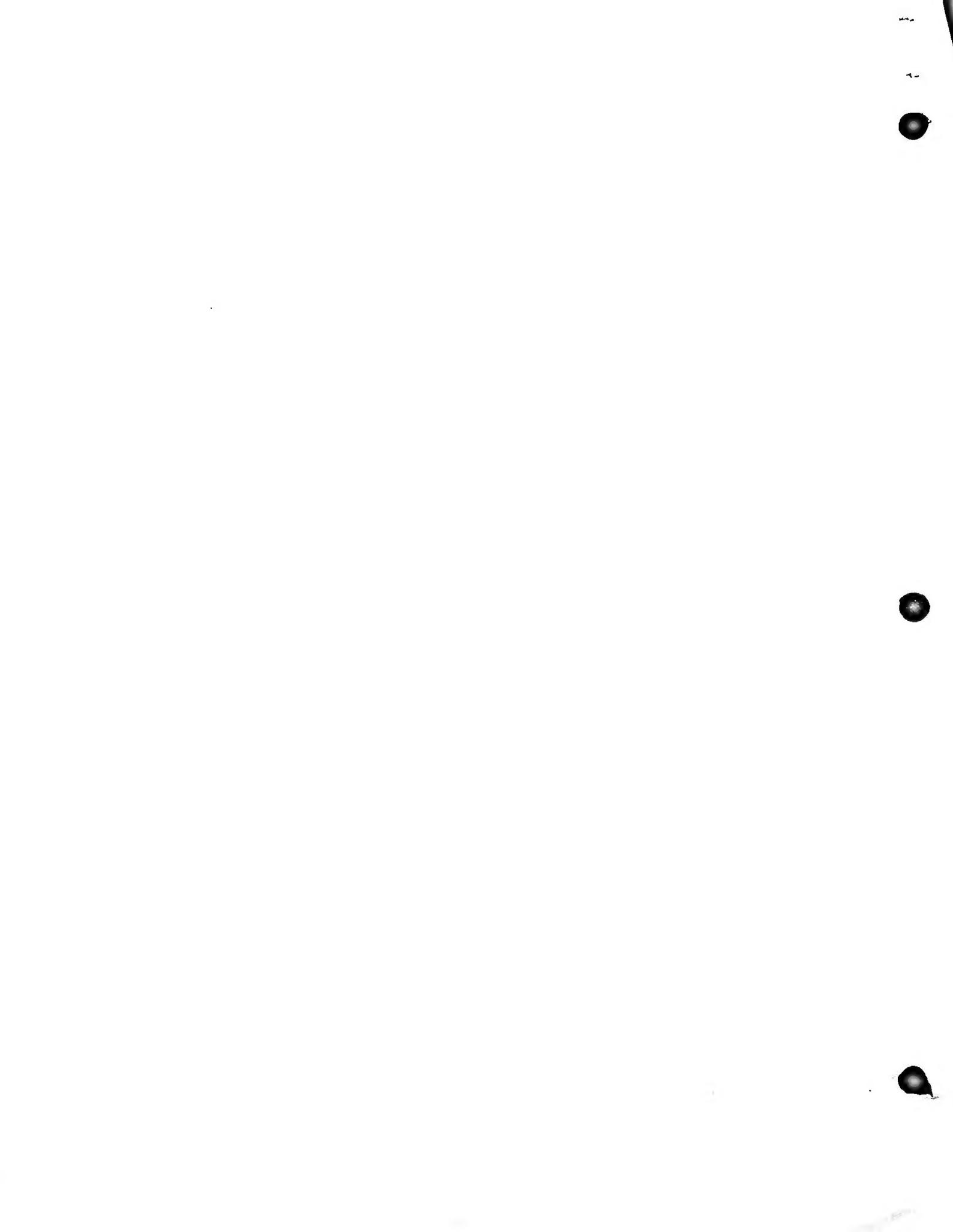USER'S GUIDE

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UTILITY PROGRAM REFERENCE MANUAL

Version 2.2.1 - 1st October 1980

CP/M 2.21 on the Onyx C8001
User's Guide and
Utility Program Reference Manual

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CP/M on the Onyx C8001

Revision History (Changed for Version 2.2.1)

This manual has been revised extensively to reflect the changes made for the release of Version 2.2.1. Sections that have been changed are marked with the notice (Changed for Version 2.2.1) as shown above.

With the advent of Version 2, Digital Research enabled the use of CP/M on the C8001 with its 10 or 18 Megabyte IMI hard disk. This version of CP/M views the physical hard disk as though it were several logical disks. Each logical disk can be thought of as an independent disk unit.

In addition to the hard disk, the C8001 has a DEI tape cartridge drive. This tape cartridge is used primarily for taking backup copies of the disk - and in the event of disaster can be used to re-load the data on the disk.

There are two main software components for CP/M on the C8001. Firstly there is CP/M itself, and secondly there is the Standard Utilities package. This latter is the collection of programs that can be called upon to perform tasks that are necessary for those features which are unique to the C8001 - tape backup and re-loads, for example.

This document describes the features of CP/M as they pertain to the Onyx C8001. The respective software version numbers are :

        * CPM - Version 2.2.1

        Two configurations are available :
- Single and double 10Mb disks (the second 10Mb disk "daisy-chained" to C8001)
- Single and double 18Mb disks (the second 18Mb disk "daisy-chained" to C8001).

        NOTE Johnson-Laird, Inc. will support, as standard, systems containing either two 10Mb or two 18Mb drives. Those users wishing to intermix 10 and 18Mb drives in the same system should contact Johnson-Laird for support and pricing information.

        * Standard Utilities Package Version 1.0

        Consisting of :
- DBACK - Provides disk backup to tape.
- DLOAD - Provides disk reload from tape.
- DVFY - Provides verification that backup tape is legible.
- HLOAD - Provides for disk reload from previous Housekeeper Tape.
- PUB - Enables public files on User 0.
- PRIV - Disables public files on User 0.
- LOADREL - Load Software Release Tape.

Overview of Release 2.2.1 (Changed for Version 2.2.1)

CP/M 2.2.1, as the version number implies, contains CP/M 2.2 as received from Digital Research. CP/M is copyrighted by Digital Research.

CP/M Bugs Fixed in this release

Version 2.2.1 of CP/M on the C8001 has fixes for several bugs that were found in Version 2.2.0., namely, those reported in the following Software Problem Reports (SPR's) :

* SPR CP/M-001.
  Unexpected change of default logical disk.

* SPR CP/M-002.
  Problem with FREEZE and double disk CP/M.

* SPR CP/M-003.
  FREEZE Utility saves clock setting.

* SPR CP/M-004.
  DTR must be high with ETX/ACK protocol.

* SPR CP/M-005.
  Public files on User 0.

* SPR CP/M-006.
  Data characters dropped on parallel printer.

User Memory Available (Changed for Version 2.2.1)

The Single Disk release of CP/M has been configured so that the total number of bytes available to the user will be D800H (55296 decimal) for a 10Mb Disk system, and D400H (54272 decimal) for a 18Mb Disk system.

The Double Disk release makes D400H (54272 decimal) bytes of memory available to the user for a double 10Mb Disk system, and D000 (53248 decimal) available for a double 18Mb Disk system.

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New CP/M features in this release (Changed for Version 2.2.1)

With this release, Johnson-Laird, Inc. has incorporated several new features into CP/M on the C8001. These are :

* Public files on User 0.
  The user may elect to make the files on User 0 of all logical disks public. Public files may be accessed from any user number as though they resided in that user's space. Frequently used .COM, .BAS, and .INT files, for instance, could be made read-only and kept in this 'common' area.

* Housekeeper no longer supported.
  The housekeeper will no longer be supported on this and future releases. In its place, the Standard Utilities Package will be supplied. With these programs it will no longer be necessary to reset the machine when taking a back-up to tape. Data on all tapes previously created by the Housekeeper will be accessible through a special utility. (HLOAD. See below.)

Additions to Standard Utilities Package. (Added for Version 2.2.1)

The following Utility programs are supplied at no cost with the Standard Release Tape. They are summarized below :

* DBACK
  This allows the user to make a backup copy of one or more logical disks onto a tape cartridge.

* DLOAD
  This allows the user to reload one or more disks from a DBACK tape.

* DVFY
  This allows the user to verify the integrity of data on a DBACK tape by reading every block on the tape.

* HLOAD
  This allows the user to reload backup tapes created with the Housekeeper.

In addition to these programs which replace the Housekeeper, the following are supplied with the standard system.

* PUB
  Makes the files on User 0 public - that is, available for access from any other user number.

* PRIV
  Disables the 'Public Files on User 0' feature. Makes files on User 0 completely 'invisible' on any other user number.

* LOADREL
  Loads Software Release Tapes on a file-by-file basis. Makes it unnecessary to completely reload the A: drive when installing new software.

Release Packaging (Changed for Version 2.2.1)

CP/M 2.2.1 is available in two forms :

Standard Release

This release is primarily intended for the end-user who has no real requirement to modify the system configuration or options once having set them.

This release contains the following software components (plus the relevant documentation) :

* CP/M for Single and Double 10Mb Disk, or Single and Double 18Mb Disk.

* The release programs supplied by Digital Research for CP/M. These are :

- PIP - Peripheral Interchange Program.
  This program copies information from one file (or peripheral) to another.

- ED - Text Editor

- ASM - 8080 Assembler

- LOAD - Loader Program for ASM output

- DDT - Dynamic Debug Tool

- STAT - File/Disk Status

- SUBMIT - Submit file of CP/M commands

- XSUB - Extended Submit

- DUMP - File dump (example program)

* Additional utility programs supplied by Johnson-Laird, Inc. :

- DATE & TIME - display & set utilities

- LOADREL - Software Release Tape loader

- PATCH - system patch utility

- PRIV - disables public files on User 0.

- PUB - enables public files on User 0.

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- SPARE - spare directory utility

- Standard Tape Utilities.
    o DBACK - for backing up the disk to tape.
    o DLOAD - for reloading the disk from tape.
    o DVFY - for verifying the integrity of a DBACK tape.
    o HLOAD - for reloading the disk from a (previously created) Housekeeper
      tape.

- PIPRX
  Modified form of PIP for receiving ASCII files from another computer.

- BASDL
  An example program in Microsoft BASIC showing how to send data to PIPRX. BASDL
  normally would execute in the system sending data to the Onyx.

- TX/RX
  More sophisticated inter-system file Send and Receive utilities. (Source Code
  provided.)

Enhanced Release

This contains the Standard Release plus all the utilities described below. Complete documentation for these utilities is
provided herein.

* ASSIGN
  This controls the dynamic assignment of peripherals from the console.

* PROTOCOL
  This controls the protocols used by the individual serial devices.

* SPEED
  This controls the baud rates of the serial ports and the tick rate of the clock.

* FREEZE
  This 'freezes' the current setting of the peripheral assignments, baud rates and
  protocols currently in force.

* OPTIONS
  This allows the user to set certain, optional parameters to new values.

* CCREADY
  This is a specialized utility that allows the user of Microsoft BASIC to retain the
  type-ahead feature of CP/M on the C8001.

* DO
  This allows the user to enter multiple statements on a line, for subsequent
  processing by CP/M.

Additional Packages

Several additional packages are available with Version 2.2.1. These are the Tape ARCHIVE facility, disk and tape management packages, two different BDS 'C' interface libraries and the systems package.

Tape ARCHIVE Facility (New for Version 2.2.1)

This utility allows the user to back up and reload individual files on tape cartridges. A sorted directory is maintained for all files on tape. Within this directory, a sequence number is appended to each file so that multiple copies of the same file may be referenced uniquely.

Disk Management Package (New for Version 2.2.1)

Contains several programs to help the user manage his disk space more efficiently. The following programs are included in the disk management package :

* DDUMP
  Dumps absolute sectors from the disk in HEX and ASCII format. Extemely useful for low-level work on the disks.

* DSTAT
  Prints a map showing percentage of disk space usage by user number.

* FCOMP
  Does a byte by byte compare of two files and prints those records (in HEX and ASCII format) which are not identical.

* FDUMP
  Prints out a formatted dump of a disk file in HEX and ASCII format.

* FINDALL
  Given a (possibly ambiguous) file name (and optional drive) prints out a map showing on which user number(s) and disk(s) the file can be found.

* INVIS
  Changes a (possibly ambiguous) file from any specified user number to User Zero and sets it to system and read-only status. This eliminates the need to PIP the file to User 0 and then issue two STAT commands. This is <u>very</u> <u>useful</u> for those converting to the 'public files on User 0' option.

* MOVEF
  Changes any (possibly ambiguous) file from one user to another. The files are <u>not</u>

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copied so very little overhead is involved.

* QERA
  Erases files but queries with each filename beforehand, allowing the user to retain
  certain files.

* UNERA
  Reactivates a file which was inadvertantly ERAsed. Must be run immediately after the
  ERA command or the directory may be damaged.

* VIS
  Removes the system and read-only status from a (possibly ambiguous) file on any
  specified user number.

Tape Cartridge Management

This consists of documentation and relocatable binaries for the tape cartridge drivers. In addition, a tape dump utility,
TDUMP, will be supplied. This program will display any data block on the tape in HEX and ASCII format.
NOTE - Because these drivers are proprietary software, only the relocatable binaries will be made available. In addition,
the user will be required to return a signed, non-disclosure agreement prior to shipment.

'C' interface libraries.

The following libraries are supplied in .CRL format. They are ready to be linked to your code with the utility program
CLINK.COM, supplied with the BDS 'C' compiler.

* Disk interface library.
  Contains various routines to read and write to the disk directory and to absolute
  tracks and sectors on the disk. High level interface routines to allow easy access to
  CP/M file names - functions to turn input parameters into FCB's, compare
  ambiguous file name 'masks' with actual names, search CP/M's directory for all files
  matching an ambiguous name, etc.

* Tape interface library.
  For purchasers of the tape management package only. Has functions to open and
  close tape, rewind, set channel, read block, write block and search for a given
  block. Also a tape error message processor.

Systems Package

This package is primarily intended for those sites where custom software is being developed. It will consist of the following material :

* The source code for the BIOS Serial Port and Parallel Port drivers. This source code will be in Microsoft M80 (Z80) format.

* System Regeneration Binaries, as provided by Digital Research.

* System build procedures (SUBMIT files).

* Internal Maintenance Documentation for the BIOS and the configuration block, containing peripheral assignments, protocols, etc.

NOTE - Johnson-Laird, Inc. will not be able to provide the same degree of support for those users who modify their BIOS drivers.

Licensing

Johnson-Laird, Inc. is the authorized distributor of CP/M for the C8001. As such, any correspondence regarding CP/M on the C8001 should be addressed to Johnson-Laird, Inc. rather than to Onyx Systems.

Johnson-Laird, Inc. will be responsible for preparation of upgrade tapes as new versions of CP/M or associated utility programs become available.

Users of CP/M on the C8001 are reminded that the serial number assigned to individual copies of CP/M is unique. This serial number must be quoted in all correspondence with either Johnson-Laird, Inc. or Digital Research.

The CP/M registration card, enclosed with each Tape containing CP/M, must be filled out by the user and returned to Johnson-Laird, Inc.

Each copy of CP/M and each utility program is licensed for use on a single C8001 computer system. Johnson-Laird, Inc. will not be responsible for any program or data loss if any given copy is used on more than one system.

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Contents of the CP/M Release Kit

A release kit as distributed by Johnson-Laird, Inc. will contain the following :

* A Tape Cartridge containing Software and packaged along with a Software License Agreement and CP/M User Registration Card.

* A CP/M upgrade voucher which is to be returned to Johnson-Laird, Inc. when an upgrade becomes available.

* Two Software Problem Report forms to be used to report problems with CP/M or its associated utilities to Johnson-Laird, Inc.

* The following manuals :

  - This manual!
  - An Introduction to CP/M Features and Facilities
  - CP/M 2.0 User's Guide for CP/M 1.4 Owners
  - CP/M 2.0 Interface Guide
  - CP/M Dynamic Debugging Tool (DDT) User's Guide
  - CP/M Assembler (ASM) User's Guide
  - ED - A context Editor for the CP/M Disk System, User's Manual
  - CP/M 2.0 Alteration Guide (included for the sake of completeness)

Services provided by Johnson-Laird, Inc.

As the distributor of CP/M for the C8001, Johnson-Laird, Inc. will provide the following services :

Upgrade Service

From time to time, as new releases of CP/M are made by Digital Research, when corrective code needs to be installed, or when new utility programs are developed for the C8001, Johnson-Laird, Inc. will inform all registered users that a new version of the system is available.

Those users wishing to obtain the new release of the system should return their original Release Tapes to Johnson-Laird, Inc. along with the Upgrade Voucher included in the Release Kit, and the new system will be written to the Tape and then returned to the user.

For upgrades of CP/M or for corrective code releases, the cost to the user will be minimal, mainly covering only the cost of shipping and handling.

Special System Modifications

As a service to users, special system modifications will be considered by Johnson-Laird, Inc. Each request will be considered and, where appropriate, the user requesting the modification will be supplied with an estimate of time and cost for implementing the change.

Bug Reporting

Johnson-Laird, Inc. will act as a focal point for users wishing to report Software Bugs to Digital Research. If appropriate, details of such bugs will be circulated to all registered users, along with any relevant corrective code or procedures.

Downloading Service

Johnson-Laird, Inc. will provide, for modest fees, a downloading service such that registered users lacking access to diskette-based systems may transfer CP/M programs from single density diskettes (standard 8" soft sectored format) to C8001 Tape Cartridges. This will permit users having access only to a C8001 to acquire applications software on the open market (where it is normally supplied on diskettes) and then to run the programs on the C8001.

Utilities are provided by Johnson-Laird, Inc. that will permit users with access to diskette-based systems to perform their own downloading (see the TX/RX programs).

Policy regarding BIOS Source Code

The source code for the BIOS (Basic I/O System), which includes the disk driver and the tape cartridge driver, will not be available to users except as described above in the Systems Package outline.

User's Guide to CP/M on the C8001

The following paragraphs are written on the assumption that the user has read the C8000 User Guide supplied with the Onyx C8001 Computer System.

Installing CP/M on the C8001

CP/M is provided by Johnson-Laird, Inc. on a tape cartridge containing CP/M, the CP/M utilities and the standard release utilities described above. This tape can be "booted" using the Tape Bootstrap that is written as the first block on the Tape.

Before installing CP/M on the C8001, the user should familiarize himself with its naming conventions. Briefly, the 10Mb physical disk is sub-divided into 4 logical areas. The first portion of the disk is referred to as the Reserved Area. It contains the primary disk bootstrap, the spare track and the CP/M image itself (both single and double disk versions). During normal operation, the user cannot refer to this area directly. It is 'invisible' to CP/M.

Immediately following the reserved area are Logical Disks A:, B:, and C:. These are the 'disks' that CP/M manages. All user data and programs are stored here and are completely accessible at run time. For an expanded treatment of this subject, the user is directed to the following section on Disk Organization.

The procedure for installing CP/M is outlined in the following steps :

1 Follow the steps defined in Chapters 2 and 3 of the C8000 User Guide which cover unpacking, setting up and powering on the C8001.

2 When all is ready to begin the CP/M installation, load the CP/M Release Tape into the Tape Cartridge Drive being sure to insert the tape gently but firmly into the unit. On insertion the tape will automatically position to the beginning of tape.

3 Press RESET (the small red momentary-contact button on the upper part of the rear panel). When the "*" is displayed on completion of the Self-Test, enter the single letter "T" or "t". This will initiate the tape bootstrap sequence. The ROM bootstrap reads in the first block from the tape, which in turn reads in the software distribution tape loader (LOADSDT).

4 When LOADSDT is entered, it will display a sign-on message and immediately attempt to read the tape. If the tape drive malfunctions, LOADSDT will print the message :

        Unable to open tape

and abort. Re-insert the tape and try again from step 2. If the problem persists, a hardware problem is indicated.

In the event that the tape itself has become corrupted, LOADSDT will print the message :

```
          Unable to skip data block n
```

and abort. If this error persists after retrying several times from step 2, the user should contact Johnson-Laird, Inc. for permission to return the tape.

5 LOADSDT next prompts :

```
          Enter number of tape tensioning passes ( CR if 0)
```

(This message takes the place of the 'I' option under the old Housekeeper.)

LOADSDT allows the user to specify the desired number of passes but does not perform them until completion of the operator dialogue. Enter the desired number of passes. (Zero is normally selected; however, if tape problems are encountered, three or more passes may correct them.)

6 The user must next indicate which type of load (or re-load) is being performed. LOADSDT prompts :

```
          First time installation erases spare sector
          directory and loads Reserved Area and
          Logical A: drive.
          Enter y if first time installation :
```

(A first time installation takes the place of the 'E' command in the old Housekeeper, followed by a reload of Logical drive D.)

If this is the first time CP/M is being installed on the machine, or if another operating system has been run previously, it is necessary to initialize the spare directory (see the discussion on Spare Sectors in the following section). Enter 'y' if this is the case.

If the user elects the first time installation, LOADSDT will immediately initialize the spare directory and print

```
          Spare Directory Cleared
          Loading both Reserved Area and A: drive
```

The bootstrap and operating system will be loaded into the reserved area, while the Utilities will be loaded onto drive A.

Proceed to step 8 for further instructions.

7 If the user indicates that this is not a first time installation, LOADSDT will prompt :

```
          Load CP/M Reserved Area? y/n
```

Enter 'y' to load or re-load the operating system. Any other response will cause the Reserved Area to be skipped.

Next, LOADSDT prompts :

> Load Logical A: disk? y/n

Again, a 'y' response will cause the A: drive to be loaded or re-loaded. Any other response will cause this drive to be skipped.

8 On completion of the Load Process LOADSDT will display :

> Software Load Complete.
> Hit Reset and then type :
> Carriage Return - Single Drive CP/M
> D - Double Drive CP/M

The user must then reset the C8001. When the "*" is displayed after the Self-test has been run, entering a single Carriage Return will cause the Single 10/18Mb Disk version of CP/M to be loaded. CP/M will then display its own sign-on message, along with version number and details of the logical disk configuration. In order to load the Double 10/18Mb Disk version, enter a "d" or "D" after the "*".

Once CP/M has signed on, enter the STAT *.* command to list the directory for logical disk A: as a quick test that all is well.

NOTE - The utilities supplied on the standard distribution tape have been set to system and Read-Only status (using STAT or INVIS). Therefore, if the user types DIR, no files will be listed.

Disk Organization

Logical Disks

As mentioned previously, CP/M views the physical disk as being divided up into logical disks. Each logical disk is identified by a letter; this letter is used as a prefix to CP/M commands, or when taking a backup to tape.

The details of the 10Mb physical disk are as follows :

```
Number of Bytes per Sector              512
Number of Surfaces                        3
Number of Sectors per Surface (Track)    18
Number of Sectors per Cylinder           54
Number of Tracks per Disk               354
Number of Sectors per Disk            19116
```

The 18Mb physical disk is arranged as follows :

```
Number of Bytes per Sector              512
Number of Surfaces                        5
Number of Sectors per Surface (Track)    18
Number of Sectors per Cylinder           90
Number of Tracks per Disk               380
Number of Sectors per Disk            34200
```

The details of the logical disks are shown in the table below:—

For the 10Mb drive :

Logical Ident.	A:	B:	C:
Start Track on Physical Disk	10	58	206
No. of 512-byte sectors	2592	7992	7992
No. of 2048-byte alloc'n units	648	1998	1998
Storage Capacity in bytes	1.296M	3.996M	3.996M
No. of file Directory Entries	256	1024	1024

For the 18Mb drive :

Logical Ident.	A:	B:	C:
Start Track on Physical Disk	10	58	218
No. of 512-byte sectors	4320	14400	14400
No. of 2048-byte alloc'n units	1080	3600	3600
Storage Capacity in bytes	2.212M	7.373M	7.373M
No. of file Directory Entries	256	1024	1024

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The descriptions above are identical for the second physical disk, with the exception that the Logical Idents. are D:, E: and F: (corresponding to A:, B:, and C: respectively).

As a footnote, the Onyx Reserved Area (which occupies the first 10 tracks of the disk) contains Bootstrap Code and CP/M itself. In addition, Track 8 is reserved for handling "Spare" sectors; a discussion of this follows.

Spare Sectors

If any given sector of a floppy diskette gives permanent read or write errors, it is easy enough to replace the diskette. This approach cannot be used with sealed-unit hard disks; instead, Track 8 of the hard disk is reserved for use as Spare Sectors.

During the initial system load, LOADSDT creates an empty spare directory, and empty CP/M directories on Physical Disk 0 (i.e. the drive inside the C8001 - as opposed to Physical Disk 1 which is the external daisy-chained drive in the Double Disk system).

In the course of normal operation, if any sector fails the read-after-write check, then that sector is "spared". The act of sparing a sector causes its Track and Sector number to be entered in the Spare Directory (held in the first sector of the Spare Track). Any subsequent attempts to read or write a sector that has been spared will cause access to the spare sector rather than to the original sector.

Serial I/O Devices

Standard Settings on Release Tape

The Basic I/O System (BIOS) within CP/M has been written to support the following serial devices (the number in parenthesis corresponds to the EIA connector on the rear panel of the C8001) :

* A serial terminal (J104)
* A serial printer (J103)
* A serial device connected to the Modem Port (J102)

X-ON/X-OFF Protocol

X-ON/X-OFF protocol is built into CP/M, specifically into the BDOS. This protocol allows a serial device to interrupt temporarily the flow of output data coming from CP/M, and then after an indefinite pause (determined by the device in question), resume the output data flow. On the release tape, and unless requested otherwise, the console and the serial printer ports are configured to respond to the X-ON/X-OFF protocol.   Users of the Enhanced Release are directed to the PROTOCOL utility for more information regarding available protocols and how to invoke them.

Data Terminal Ready

The BIOS routines, as an option, will not send data to a serial device if the device lowers Data Terminal Ready. This is the signal on Pin 20 of the EIA plug that connects to the Terminal Port [J104].

The standard release setting is such that, for data to be sent to the serial printer, DTR must be high. In addition, Xon/Xoff protocol is maintained for the printer.

Baud Rates

The Console Baud rate is set by the small DIP switches on the C8001 circuit board. These are accessible only when the top cover of the C8001 is removed. The time to set the Baud rate for the console is when the cover is first removed to unlock the disk heads.

The default baud rate for both the Modem and Serial Printer Ports is 1200 baud. Users with the Enhanced Release can use the SPEED utility to change baud rates.

The CP/M Housekeeper (Section deleted for Version 2.2.1)

Section deleted.

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Error Messages

This section of the manual deals with all the error messages that are likely to be displayed on the C8001. In many cases, the user cannot take any remedial action (such as for hardware failures); nevertheless, the errors are listed here for the sake of completeness.

The errors are classified into the following sections :

* C8001 Self-Test
  This is the test program that executes automatically after power has been applied to the C8001. This information, although available in other Onyx-supplied documentation, is included here as a convenience.

* Primary Bootstrap
  This program is responsible for loading CP/M.

* Disk Driver
  This program is used by CP/M to address the disk(s).

* Tape Cartridge Driver
  This program deals directly with the Tape Cartridge. It is used only by the Tape management utilities.

C8001 Self-Test Errors

Superficially, the Self-Test program only indicates the outcome of the test by displaying "COMPLETE", "FAILED" or "PARITY FAILURE" following the identification message. Inside the C8001 there is a group of three small LED's (Light Emitting Diodes). These LED's can be viewed by removing the top cover of the machine and are numbered 1, 2 and 3. They are used by the Self-Test to indicate the current phase of the test. If a failure occurs, they are left on to show in which phase it occurred.

The significance of these LED's is as follows (The numbers shown are those of the LED's illuminated) :

    321 ROM Sumcheck Failure
    32- RAM Failure
    3-1 RAM Failure (Bank 0)
    3-- Memory Parity Chip Failure
    -21 Tape Cartridge Failure (no select)
    -2- Disk Failure (cannot select/read)

Any one of the above failures is sufficient grounds to require technical assistance. From the user's point of view, it is worth powering the machine off and then on again.

In the case of Memory Parity Chip failure, which is a failure of the parity chip itself rather than the main data memory, the user may attempt to use the system by typing a carriage return after the "FAILED" message.

Primary Bootstrap Errors

The primary bootstrap executes after the user has entered a Carriage Return after completion of the Self-test. It is responsible for loading CP/M itself.

If it detects an error condition, it will output a message on the terminal of the form :

    Primary Error n

where n is a number from the list below. It should be emphasized that there is little recovery action that the user can take other than attempting to re-load the disk from the last backup tape made, and even this can be fruitless if a hardware failure has occurred.

    0 Error in preparing for Read/Write
    1 Time out error
    2 Fault status during seek
    3 Seek error
    4 Sector Header CRC error
    5 Home to track 0 error
    6 Fault status after home to track 0
    7 Disk not ready (on-line)
    8 Fault status after write
    9 Unallocated
    10 Fault status after read
    11 Sector Data CRC error
    12 Sector Locate error
    13 Attempt to write on Protected Disk
    14 Sector Address out of range

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Disk Driver Errors

In general there is little that the user can do to recover from these errors, with the exception of those marked with an "*". In these cases it is worth re-loading the disk from a backup tape. The act of re-writing the disk will refresh the data on the disk and thereby may allow the user to re-run the job that stopped because of the error.

Whenever an error is detected by the disk driver, it displays a message on Terminal #1 of the form :

    *** DISK ERROR disk,code,track,sector

where track and sector (in hexadecimal) are the logical disk and logical sector involved when the error was detected.

Code is one of the following :

        64 No acknowledge from disk
        65 Incorrect Busy acknowledge
        66 Timeout error
        67 Fault status in drive
        68 CRC error
        69 Seek error
        6A Verify error
        78 Error in preparing for Read/Write
        79 Timeout error
        7A Fault status during seek
        7B Seek error
        7C Sector Header CRC error *
        7D Home to track 0 timeout error
        7E Fault after home to track 0
        7F Drive not ready (on-line)
        80 Fault status after write
        81 unallocated error code
        82 Fault status after read
        83 Sector Data CRC error *
        84 Bad sector header information *
        85 Write on protected drive
        86 Sector number out of range
        87 Spare Directory Full *
        88 Write Error on Spare Directory *
        89 Attempt to Spare (Yank) a sector already spared

Reminder : "*" above indicates those errors which may be overcome if the disk is reloaded from a backup tape.

Tape Related Errors (New in Version 2.2.1)

During the course of Tape Cartridge operations, the tape driver may output one of the messages described below. If the message description is not followed by some indication of how to recover, then the user may infer that either a hardware or software failure has occurred (that is, there are some messages that should "not happen").

* ILLOGICAL ERROR
* TAPE NOT OPEN
* IMPOSSIBLE ERROR STATE
* NO DATA DETECT SIGNAL
* DAD BUT NO SYNC
* TOO LONG ASSEMBLING CHARACTER
* TOO LONG ASSEMBLING CRC
* BEGINNING OF TAPE ERROR
* DRIVE NOT READY
* IRRECOVERABLE ERROR
   This message has been observed with poor quality tape cartridges, poor tape tension or when the Tape Drive has failed.

A Note on the Importance of Tape Tensioning

Practical experience has shown that the tension of the tape in the cartridge is very important to the reliability of data transfers to and from the tape.

The various tape-oriented utilities request the user to specify the number of tensioning passes. These tensioning passes have the effect of settling the tape tension down to a uniform level.

It is recommended that three passes be performed whenever a new tape is about to be written to for the first time, or whenever a tape is about to be used (either for reading or writing) when it has not been used for several weeks, or if it has been subjected to temperature variations (such as those encountered in the mails).

Experience indicates that Scotch DC 300 Tapes are reliable. These are available as either DC 300A or DC300XL - the 300A being shorter than the XL. The DC 300A can easily contain the entire B: or C: drive's data. Use the XL size for entire disk dumps. The DC300A tapes are now available "certified" for the high packing density used on the Onyx C8001. These are recommended as the best ones available at the moment.

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Useful Procedures for CP/M on the C8001

Downloading Source Code from Other Machines

After installing the release tape on a C8001, disk A: has two utility programs on it to assist with the task of downloading source code from other machines.

PIPRX.COM is a patched version of the standard utility PIP. It has been modified such that the symbolic input device INP: is connected to the modem port. This means that a command line of the form :

        PIPRX B:NEWFILE.ASM=INP:[BE]

will cause PIP to read the Modem Port in Block mode and Echoback the incoming characters to the Terminal.

An example of a Microsoft BASIC program called BASDL.BAS that functions with PIPRX is also included on disk A:. This program allows data to be sent to the Onyx. BASDL normally executes in the machine sending date to the Onyx.

As a convenience, a listing of this program is shown in Appendix B of this document.

Note that the ribbon cable inside the C8001 that is used to connect the Modem Port to the CPU board has two possible positions. Either it can be plugged into the socket closest to the rear of the C8001 or into the socket immediately adjacent (towards the front of the C8001). The only difference is that the Data and Control lines are transposed (Transmit and Receive Data and others).

When attempting to download source programs, if no data transfer appears to be happening, try changing over the socket into which the ribbon cable is plugged. Also double check that the other machine is sending data at the same rate at which the modem port is operating (default is 1200 baud).

Note that PIPRX/BASDL can be used to receive/send ASCII data files only; the utility programs TX and RX are supplied to permit .COM files to be downloaded. Johnson-Laird, Inc. also offers a downloading service. (See the earlier section that discusses this.)

Incompatibility with Other CP/M Versions

The only known incompatibility is in the subroutine SETTRK; this is used to set the track number of the next read/write operation on the disk.

The problem is that the version of SETTRK that exists in the BIOS for CP/M 2.0 is unaware of the fact that the hard disk is divided up into smaller logical disks. For example, Disk A:'s track 0 is in reality track 10 on the physical disk. The higher level calls to the BDOS via location 5 have been made aware of this problem; however, any applications program or utility that calls SETTRK directly is headed for disaster.

Power and Parity Failure

The C8001 is set up by CP/M to generate an interrupt if either a memory parity failure is detected, or if an impending power failure is sensed. In the case of memory parity failure, CP/M sounds the bell on the terminal and sends the message "*MP*". In the case of power failure, the message is "*PF*". Note that, when switching the machine off, one or the other of these messages may appear on the console.

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DATE - System Date Utility

Purpose

DATE allows the user to set or display the current date. This date remains unchanged as long as the system is not reset and can be accessible to Application Programs.

Calling this utility a "date" utility is really a misnomer. In fact, it allows a 10 character string to be entered from the console and saves the string in high memory for subsequent display or user program access.

How to use DATE

To set the system date enter the command :

```
    DATE date string
```

No check is made on the format or the validity of the date string. In fact, it need not even be a date at all! The date string is terminated by the first blank or the end of the line; this means that to enter the date in the form 1 May 80, the user must instead enter it as 1-May-80.

To display the current "date", enter the DATE command without any parameters.

An internal flag is kept that records whether the DATE utility has been used since system start-up. It is assumed that the date is "accurate" after the DATE command has been called with a date string. If DATE is called without parameters and if the system date has not been changed since system start-up, the current release date of CP/M is displayed.

Accessing the Date from a Program

The Date string is stored in upper memory starting at location 0FFDDH (65501 decimal). The string is terminated by a byte containing 00H.

DBACK - Disk Backup Utility

Purpose

DBACK is a utility program that copies data from the disk drive to a backup tape. The user may specify some or all of the logical disks which are to be included in the backup.

How to use DBACK

Before running DBACK, the time and date must have been set using the appropriate utilities (see TIME and DATE). No parameters are required on the command line. Simply enter :

        DBACK

If the time and date have not been set, DBACK will immediately print the following message(s) and abort :

        Please set time using 'time hh mm ss'
        Please set date using 'date mm/dd/yy'

DBACK next prompts for the required tensioning passes as follows :-

        Enter number of tape tensioning passes (CR = 0)

Any request for tensioning will not be performed until the entire dialogue is complete, allowing the user to set up the parameters and then leave the machine unattended during the backup.

DBACK next prompts for the logical disks which are to backed up :

        Enter single character 'y' to backup given disk
        Backup disk A - y?

(NOTE - disk 'A' is shown as an example.) If the user responds 'y', DBACK will proceed to the next logical disk as follows :

        Backup disk A - y? yes
        Backup disk B - y? n   <=== Not Backed Up!

(NOTE - the 'es' characters after the 'y' which the user entered are typed by DBACK.)

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In the event the user requests to back up more data than will fit on a DC300A cartridge (backing up disks A, B, and C will cause this condition) DBACK asks the user to verify that an eXtra-Long tape is being used :

        Caution - confirm that you are using a DC300XL tape Cartridge.
        Enter a carriage return to continue or Ctl-C to abort.

Enter carriage return <u>only</u> if using an extra-long tape. Attempting to use a shorter tape will cause the backup to fail when it reaches the end of tape.

If the user has a two disk system, DBACK will prompt to back up the second drive (logical D:, E:, and F:) as well. When the total requested dump nears the absolute limit of a DC300XL tape (about 12 Mbytes), the following warning message will be printed.

        Caution - a DC300XL cartridge can only hold approx 25,000 512
               Byte sectors.
        Currently the total you have requested is 21,487.

(NOTE - the number of sectors requested may not equal the amount in the example.) Requesting more logical disks at this point will cause DBACK to fail when end of medium is reached.

DLOAD - Disk Load Utility

Purpose

DLOAD is a utility program that reloads data from a backup tape to the disk. The tape must have been written using the DBACK utility. (NOTE - use HLOAD to reload tapes created under the Housekeeper.) The user may specify some or all of the logical disks which are to be included in the reload.

How to use DLOAD

The user calls the DLOAD utility by typing :

        DLOAD

Upon being called, DLOAD attempts to read the tape label. If the tape was created by the Housekeeper, it displays the following message :

        Tape Written by Housekeeper #A or #B
        Run HLOAD to load this tape.

and exits to CP/M.

If the tape was written by DBACK, the label is displayed next in the form :

        Label = A C, Time = 20:14, # Sectors = 12114
        Enter Control-C to abort, anything else to continue with load.

If this is not the correct tape, type Control-C. Otherwise, enter a carriage return to proceed to the next prompt :

        Enter number of tape tensioning passes (CR = 0)

Enter the number of passes required. No tensioning is performed until all further interaction is completed. This allows the user to set up the desired operations and leave the machine while the reload is proceding.

NOTE - Experience has shown that three tensioning passes are required when using a tape for the first time. At other times, no tensioning is necessary unless a large number of tape errors were previously encountered.

DLOAD next asks the user to indicate which of those disks contained on the backup tape are to be reloaded. It is not necessary to reload all of the disks which were originally backed up. For each of the disks on the tape DLOAD prompts :

```
        Enter single character response to disk selection

        Load disk A - y?
```

The proper responses are shown below :

```
        Load disk A - y?  yes
        Load disk C - y?  n   <=== Not to be Loaded!
```

(NOTE - the 'es' characters after the 'y' entered by the user are typed by DLOAD.)

Upon completion of this dialogue, the tensioning (if requested) and the load proceed automatically. No further operator action is required.

DVFY - Disk Backup Verify Utility

Purpose

DVFY is a utility program that verifies the data on a backup tape. The tape must have been written with the DBACK utility.

How to use DVFY

The user calls the DVFY utility by typing :

        DVFY

Upon being called, DVFY attempts to read the tape label. It displays the following message :

        Checking to see that Tape is legible

The tape label is displayed next in the form :

        Label = A C, Time = 20:14, # Sectors = 12114
        Enter Control-C to abort, anything else to continue with load.

If this is not the correct tape, type Control-C. Otherwise, enter a carriage return to proceed to the next prompt :

        Enter number of tape tensioning passes (CR = 0)

Enter the number of passes required. No action is taken on this command until all further interaction is completed. This allows the user to set up the desired operations and leave the machine while the verification is proceeding. Normally, no tensioning is necessary unless tape errors caused a previous DVFY or DLOAD to fail.

Upon completion of this dialogue, the tensioning (if requested) and verification proceed automatically. No further operator action is required.

HLOAD - Load Previously Created Housekeeper Tape

Purpose

HLOAD allows the user to reload a backup tape that was written by the Housekeeper.

How to use HLOAD

The user calls HLOAD by inserting the proper cartridge into the tape drive and typing :

        HLOAD

Upon being called, the utility attempts to read the tape label. If HLOAD determines that the tape was not created by the Housekeeper, it displays the message :

        Tape not written by Housekeeper.

and aborts.

If the tape is a Housekeeper tape, HLOAD displays the label contents as follows :

        Label = BACKUP FROM DRIVE #E, # Sectors = 19116
        Enter Control-C to abort, anything else to continue with load

If this is not the correct tape, enter Control-C. Otherwise, enter a carriage return to proceed to the next prompt :

        Enter number of tape tensioning passes (CR if 0)

Normally, no tensioning is required. However, if the tape in question has not been used for a month or more, or if tape errors caused a previous HLOAD run to fail, request three passes.

HLOAD defers any requested tensioning at this point and proceeds instead to the next series of prompts :

        Enter single character response to disk selection

        Load disk A - y?

If the user responds 'y', HLOAD will print 'es'. Any other response will cause HLOAD to print '<=== Not Loaded!'. In either case, the utility continues on to any remaining disks on the tape.

After determining which disks to reload, HLOAD will perform any requested tensioning and then begin to reload the disk(s).

It is possible that HLOAD may display the following message one or more times during a reload :

        `Block Seq. Err. Previous = n, Read = m`

where n and m are some hexadecimal digits. This indicates a malformed or missing data block on the tape. The user should restart HLOAD and request three tensioning passes. If the error(s) persist, the tape is corrupt.

NOTE - Each data block on the backup tape contains 9 physical sectors of the disk (4608 bytes.) Each block also contains its own block number relative to the start of the disk. Thus, if HLOAD encounters a missing or unreadable block on the tape and is able to continue without further error, the reload will be valid in all but the 9 sectors in question. Thus, it is possible that only one or two files will be damaged. (Of course, it is also possible that some vital information such as the directory has been lost.) In any case, it is worth trying to use the reloaded files, especially if the backup contains irreplaceable data or programs.

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LOADREL - Load Software Release Tape

Purpose

LOADREL allows the user to load new release software onto his system on a file-by-file basis. It will no longer be necessary to load the entire A: drive when installing new programs on the C8001.

How to use LOADREL.

The user calls this utility by typing :

        LOADREL

If the Software Release Tape was not inserted in the tape drive, LOADREL will print :

        Load tape and type carriage return.

LOADREL then prompts :

        How many tensioning passes required?

If the tape being loaded has recently come through the mails or if it has not been read in a number of weeks, request three passes. Otherwise, no tensioning is required.

After performing any requested tensioning, LOADREL begins loading the files on the tape. For each file loaded, LOADREL prints :

        Loading filename

with the appropriate filename. If the file that LOADREL is attempting to load already exists on the disk, LOADREL prompts :

        File filename exists on disk.   Overwrite?

If the user responds 'y', LOADREL will erase the exising file and create a new copy. In that event, the previous file is lost. If the user enters any other response, LOADREL will prompt :

        New name for file (CR = do not load file)?

If the user enters a carriage return, LOADREL will not attempt to load the named file, but will print :

        File not loaded.

If the user enters a valid file name, LOADREL will attempt to load the file under that name. If this file also exists, LOADREL will again ask if the user wants to overwrite the file.

The above dialogue is repeated for each file on the Software Release Tape. At the end of the load, LOADREL displays :

Software Load Complete.

and exits.

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PATCH - System Patch Utility

Purpose

PATCH makes it easy for the user to install corrective code or custom modifications into the currently executing version of CP/M. It requires that the user have a superficial knowledge of the standard CP/M utility DDT (Dynamic Debug Tool).

How to use Patch

The clearest method of showing the method of use is to take a hypothetical example. Assume that a bug has been discovered in CP/M and the task at hand is, for the Single Disk version of CP/M, to change the contents of specific location to a value of 00. This location and the contents would have been identified in a Software Problem Report sent to all registered users.

The console dialogue would be as follows :

```
DDT PATCH.COM              (Load the PATCH utility)
NEXT  PC
0200 0100                  (DDT executes the load)
-G                         (Start execution of PATCH)
System Patch Utility Vn 1.0 5 April 1980
Loading System ....
complete
CCP Base = 3000H, BIOS Base = 4600H
*0116                      (Control returns to DDT)
-S4703       (Address specified in Software Problem Report)
4703 31 00   (Old contents - followed by user entered 00)
4704 22 .    (. terminates S command)
-G           (Restart PATCH again)
Re-writing system and returning to CP/M

A>           (CP/M prompt)
```

Of course, more than one byte of patch could be made. The exact requirements and console dialogue example would be defined in the Software Problem Report.

PATCH functions without change on both the Single and Double Disk configurations which, in some cases, will both require changing.

PUB/PRIV - Enable/Disable Public Files on User 0

Purpose

PUB and PRIV allow the user to enable and disable the User 0 public files facility.

How to use PUB

The files on User 0 are made public (that is, accessible to any other user number as though they resided in that user's own space) by typing :

        PUB

Upon completion of this program, the files on User 0 will be "seen" by the DIR command.

NOTE - The user is cautioned to plan the effects carefully when first converting to the 'public files' option. For instance, if there were a file named INFO.DAT on the current user and on User 0, it would appear twice in the directory listing after using PUB. If that file were then ERAsed, CP/M would remove both copies. For this reason, the user should rename his files or rearrange them with PIP (or with MOVEF and INVIS in the Disk Management Package) before typing PUB.

It is recommended that the user put all frequently accessed program and data files on User 0 and set them to system (SYS) and read-only (R/O) status using either CP/M's STAT utility or the INVIS program in the Disk Management Package. Files set to SYS status will not appear in a DIR listing. Files set to R/O status cannot be inadvertently ERAsed or overwritten.

NOTE - All files on User 0 of the release tape have been set to SYS and R/O status.

How to use PRIV

When the user types :

        PRIV

the 'public files' option will be disabled. In this case, CP/M will treat all file references exactly as it did in Version 2.2.0. That is, each user space is logically independent of all others.

NOTE - The files are not altered in any way by these utilities. For instance, if the system were currently 'in' User 3 and the user typed PUB, all files on User 0 would 'appear' in the DIR listing. If it were noticed that the file MBASIC.COM appeared twice, the user could immediately type PRIV which would make the second copy of MBASIC (on User 0) 'invisible.' If the user then erased MBASIC.COM from User 3 and typed PUB, only the file on User 0 would remain.

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SPARE - Spare Directory Utility

Purpose

SPARE allows the user to display the current contents of the spare directory; also, the user may request that a specific track/sector be added to the spare directory. This would normally be required only if a sector gives read errors. CP/M automatically spares out sectors that fail during the read-after-write check.

How to call SPARE

Enter the command name :

    SPARE

There are no parameters; instead, the utility interacts with the user.

For users with a Double Disk configuration, SPARE requests the physical disk number for which the spare directory is to be manipulated.

It then displays this directory along with a warning message if the spare directory is approaching fullness.

The user may then, as an option, add a new entry to the spare directory; the directory is again displayed as a double check.

TIME - System Time Utility

Purpose

This utility allows the user to set the system clock to either a given time of day or to reset the timer to zero when it is being used as an interval timer.

TIME can also be used to display the current time of day or the elapsed time when in interval timer mode.

How to use TIME

As mentioned above, the real-time clock can be used in one of two modes : wall-clock mode or interval timer mode. This selection depends on the current tick rate (set the SPEED utility). If the tick rate is 60, then the timer is ticking once every second and is therefore in wall-clock mode. If the tick rate is less than 60, then it is in interval timer mode.

The timer is normally in wall-clock mode and starts up as soon as CP/M is loaded. Until such time as the TIME utility is called to set the clock, the timer can only indicate the hours, minutes and seconds that have elapsed since CP/M was started.

In wall-clock mode (tick rate = 60), TIME can be called to set the time of day with the command :

```
TIME 18 56 05   (Hours, minutes, seconds)
TIME 18 56      (seconds assumed to be 0)
TIME 0          (to reset wall-clock time to 0 0 0)
```

To display the current time, simply enter the command TIME without parameters. If TIME is called without parameters before the wall-clock time has been set, it will display the elapsed time since system start-up.

In interval timer mode, to reset the interval timer to zero use the command :

```
TIME 0
```

Use TIME without parameters to display the current elapsed time. Elapsed time is displayed in the format :

```
major count / minor count
```

The minor count is updated once every tick; the major count is updated only when the minor count equals the tick rate. For example, if the tick rate is 30, the minor count will be updated every 30/60ths of a second (.5 seconds). Whenever the minor count reaches 30, it will be set back to zero and one added to the major count.

The current tick rate will also be displayed when elapsed time is displayed.

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Restrictions

In wall-clock mode, either 12-hour or 24-hour format can be used. However, no check is made for midnight and therefore the clock must be reset using the TIME utility.

Accessing the Timer by Program

The various components of the timer are stored at the locations shown below :

```
OFFD8H (65496) Major Count (3 bytes)
OFFDBH (65499) Number of Ticks since last Major
               Count update
OFFDCH (65500) Current Tick Rate
```

The default tick rate is 60 decimal. The actual clock interrupts every 1/60th of a second. Therefore, the Major Count is incremented by one every 60 ticks, i.e. once a second.

Note that the Major Count is viewed as a single 24 bit wide field - that is, the data is not held "byte-reversed" as is normally the case with 16 bit numbers.

To convert the Major Count to wall-clock time :

*Compute (OFFD9H) * 256 + (OFFDAH); this is the number of seconds in the wall-clock time.

* Divide the number obtained above by the appropriate values of 3600 and 60 as required to convert to hours, minutes and seconds.

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TX/RX Inter-System Communication Programs

Purpose

TX and RX are programs which allow the user to upload or download files between the Onyx C8001 and another (referred to as the "other") system running CP/M.

The programs are :

> * TX – The file transmit program, designed to send programs to a machine executing
>   RX.

> * RX – The file receive program, designed to receive programs from a machine
>   executing TX.

For another approach to downloading ASCII files to the Onyx, see the description in Downloading Source Code from Other Machines on Page 22 of this manual.

User Knowledge Assumed

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The user should be familiar with CP/M itself and also with the standard CP/M utilities DDT and PIP. These utilities are used in the beginning to set the scene for TX/RX to operate.

Assumptions about the other Computer System

It is assumed that the other computer system has a serial port other than that used for its console and that this serial port's parameters (the port number for status and control, and the status bit significance) are known by the user.

Getting Started

Sending RX source code to other machines

Although the most likely operation to be performed is that of TXing programs from the other machine to the C8001, it is easier to "bridge the gap" between the two machines by first getting RX running on the other machine, and then using TX to send a copy of its own source code to the other machine.

However, before even this can be attempted, the C8001 must establish communication with the other machine.

Data can be sent out of the C8001 easily enough; the PIP utility can be called up with the following parameters :

```
PIP LST:=RX.ASM
```

The source code of RX.ASM is sent to the Serial Printer port. The default baud rate for this port is 1200.

There are two remaining problems to be solved before the source code can be saved on the other machine. One is the problem of baud rate. (If the other machine also uses 1200 baud, or if there is an easy method of setting 1200, then this problem disappears.) The second problem concerns the physical wiring of the the EIA cable used to connect the two machines. The Transmitted Data of one machine must be the Received Data of the other. In other words, pin 2 of the C8001 serial printer port must be connected to pin 3 of the corresponding port on the other machine, and pin 2 of the other machine must be connected to pin 3 of the Serial Printer port on the C8001.

Modifying PIP to Receive Data

Probably the best method for ensuring that the two machines can indeed communicate with each other is to build a special version of PIP on the other machine. This presupposes that the user has the appropriate hexadecimal values for :

* The Serial Data Port
* The Serial Status Port
* The mask for the Data Ready status and knowledge of whether a bit is set high or low to indicate an incoming data character

The procedure for building the special version of PIP is illustrated by the following console dialogue :

```
DDT PIP.COM
DDT 1.4
NEXT  PC
01E00 0100
-A103
0103 CALL 110
0105
-A110
0110 IN xx      (xx = hex status port number)
0112 ANI yy     (yy = hex mask for Data Ready)
0114 JZ 110     (JNZ if Data Ready bit = 0 when Data there)
0117 IN zz      (zz = hex data port number)
0119 ANI 7F     (strip parity)
011B STA 109    (for PIP)
011E RET        (return to PIP)
011F
-^C             (return to CP/M)
A>SAVE 29 PIPRX.COM     (Save new version of PIP)
```

NOTE - This version of PIPRX is for the 'other machine.' See below for a description of PIPRX which is to run on the C8001.

This new version of PIP will accept data coming in on the specified serial port when the special "file name" INP: (note the ":") is used. For example :

    PIPRX RX.ASM=INP:[E]

This will read data from the serial port into file RX.ASM. The [E] option indicates that each character received is to be displayed on the console. This allows PIP to be used as a line monitor to show the incoming data.

Call up PIPRX in this way and confirm that when :

    PIP LST:=RX.ASM

Is initiated in the C8001, that data does indeed appear on the screen of the other machine.

Note that the only method of leaving PIPRX (other than when it decides to terminate operation) is by resetting the other machine.

It normally takes several attempts to get the two machines to "talk" to each other. Persevere!

When the complete source code for RX has been received by PIPRX, it should close file RX.ASM and then terminate. If this does not happen, connect a terminal to the other machine's serial port (the terminal must be set to run at 1200 baud) and type a control-Z. When PIPRX sees this, it will close the file and shut down.

Assembling RX on the other machine

When the source code for RX has been sent to the other machine, it must be edited to reflect the data port, status port and bits of the other machine. The standard CP/M editor ED can be used to make these changes. The changes required are clearly marked in the listing. (Look for an EQUate for symbol STAT).

Assemble the edited version of RX. There should be no assembly errors. Use the LOAD command to generate COM file for RX. Proceed to the following sections for more information about using TX and RX together. As a reminder, the first file to be sent from the C8001 to the other machine should be TX.ASM. This too, requires editing and re-assembly in order to configure it for use on the other machine.

PIPRX on the Onyx C8001

The version of PIPRX that is included on the CP/M Release Tape (both Standard and Enhanced releases) differs from the previous example in the following ways :

> * PIPRX on the C8001 uses the modem port rather than the serial printer port to
>   send and receive data.

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* The instructions patched into PIPRX are completely different from those shown in the example above. Rather than reading an I/O port directly, they make a direct call into the BIOS (Basic I/O System) to read the modem port. In addition, the code must cater for <u>two</u> different versions of CP/M (the Single and Double disk versions) and therefore cannot simply execute a CALL instruction. Instead, a CALL must be effected using the PCHL instruction.

Specifically, the instructions at location 110 are :

```
LXI     H,011C          ; Fake return link on stack
PUSH    H
LXI     H,0015          ; Build BIOS address
LDA     2               ; Base page of BIOS vector
MOV     H,A
PCHL                    ; 'CALL' Modem Input
STA     109             ; Store returned character
RET                     ; Return to PIP
```

The TX Utility

Introduction

The TX utility is written in standard CP/M Assembly Language. TX is designed to work with the program RX running in the destination machine; as such, TX is the "master" program and RX is the "slave" machine. RX receives commands from TX such as "Open file", "Read Incoming Data Block", "Write Block to File" and so on.

For this reason, the user need only worry about console operations for the machine in which TX is running.

Use of the Modem Port

In contrast to earlier operations aimed at getting the TX source code over to the other machine, TX and RX are designed to work together via the Modem Port of the C8001. This too is set to 1200 baud as a default. (See the last part of this document if it is necessary to set the Modem Port to a different baud rate). The communication hook-up must be re-connected to operate out of the Modem Port on the C8001.

The RS232 signals can be "swapped over" on the Modem Port if need be. This is done by taking off the top cover of the C8001 and moving the ribbon cable connector from the back-panel Modem Plug. When the C8001 is shipped, the Modem Plug is connected to the CPU board socket closest to the back-panel. This connector can be unplugged (by "waggling" the ribbon cable until the ribbon cable plug can be worked loose) and moved over to the socket next-but-one to the back panel.

Running TX

TX is initiated with the command :

        TX

It will sign-on with an identifying message and version number and then give the user an option to proceed or abort. The actual console dialogue appears as :

```
A>TX
 FILE TRANSFER UTILITY VERS 1.5
 HIT CR WHEN RECEIVE MACHINE READY OR Q TO ABORT
```

At this point, start up RX in C8001; just enter the command "RX" to do this.

Then type Carriage Return to TX and it will attempt (by sending out the letter "S" and waiting for a reply) to link up with the RX program.

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Given that a link can be establised, TX will display the message :

LINK TO SLAVE MACHINE ESTABLISHED

or if ten attempts fail to link :

UNABLE TO ESTABLISH/MAINTAIN DATA LINK

The TX program then prompts the user to enter both the source file name and the destination file name. It is suggested that in both cases, the appropriate disk letters be specified.

If the specified file name already exists on the receiving machine, TX will display :

FILE ALREADY EXISTS ON RECEIVING MACHINE

As an expediency, send the file again but with a temporary destination file name.

As a file is being TXed, both TX and RX display a record count. This serves to indicate that data is being Transmitted and Received. It is normal to see a difference of one record between the two counts upon completion of a file transfer.

If TX detects a failure in the data link, it will output the message :

UNABLE TO ESTABLISH/MAINTAIN DATA LINK

There have been some cases, especially where the Serial Port hardware is buffered, where the "LINK ESTABLISHED" message appears, only to be followed in short order by the "UNABLE TO MAINTAIN" message. This has been found to be an indicator of a baud rate problem rather than a wiring problem.

When a file has been transmitted, TX displays the message :

FUNCTION COMPLETE
TYPE R TO REPEAT, CR TO EXIT

If another file is to be transferred, enter the letter "R" and TX will request file names as before. Entering just a Carriage Return will cause TX to command RX to shut down. TX will also shut down.

There are two other messages that could be output by TX.

As each data block is sent, a sumcheck is calculated and transmitted. If RX detects a sumcheck failure on re-computing the sumcheck, then it will request that TX re-transmit the data block. This re-transmission will be repeated a pre-determined number of times. If the block cannot be transmitted successfully, then TX will output the message :

HARD DATA TRANSMISSION ERROR

The most likely cause of this failure is bad hardware - a loose plug or bad EIA cable.

If the disk(ette) on which RX attempts to place the incoming data file is Write Protected, or if there is insufficient space on the disk(ette), TX will display the message :

RECEIVER CANNOT CLOSE FILE

The RX Utility

Introduction

RX is an Assembly Language program designed to receive data files transmitted by TX. It is designed to operate as a "slave" program to TX and as such receives commands from TX as each RX function is to be performed.

Running RX

RX is initiated by the command :

RX

On starting up, RX displays a sign-on message of the form :

FILE RECEIVE UTILITY VERS 1.2

From this point on, unless an error condition occurs, no further operator action is required.

As each data block is received, RX outputs a running count of the data blocks received. At the end of each received file, RX displays the message :

END—OF—FILE RECEIVED

When all files have been received, and on receipt of a command from TX, RX closes down with the message :

LINK TERMINATED

If the data link cannot be established or maintained, it will be necessary to reset the receiving machine in order to exit from RX.

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ASSIGN - Peripheral Assignment Utility

Purpose

The ASSIGN Utility allows the user to alter the physical devices from which input is read and to which output is written. It can also be used to interrogate the current assignments.

Under CP/M on the C8001, there are three "logical" input devices. These are :

- * The Console (normally a CRT)
- * The Modem
- * The List Device (printer)

The ASSIGN utility permits input from any one of these logical devices to be redirected so that any one of the physical devices is read. The physical input devices are :

- * The Terminal Port (see the back panel of the C8001)
- * The Modem Port
- * The Serial Printer Port

The Modem Port can be connected to a Modem, another Terminal or even a printer. The Printer Port can also be connected to a terminal.

The ASSIGN utility permits output destined for any one of the logical devices to be directed to any one or all of the physical output devices. The physical output devices are :

- * The Terminal Port
- * The Modem Port
- * The Serial Printer Port
- * The Parallel Printer Port (cannot be used for input!)

How to call the ASSIGN utility

The simplest method of calling ASSIGN is to enter just :

    ASSIGN

in which case, the utility will output details to the console of the possible parameters that can be used with it.

The full call would be of the form :

    ASSIGN logical-device input/output physical-device

where :

* logical-device can be -
  - TERMINAL or CONSOLE
  - MODEM
  - LIST or PRINTER

* input/output can be -
  - INPUT
  - OUTPUT

* physical-device can be -
  - CONSOLE or TERMINAL
  - MODEM
  - SERIAL (the Serial Printer)
  - PARALLEL (the Parallel Printer)

Note that for all the parameters, only the first character is checked; the full word is shown above for clarity. Also, this first character can be entered in either upper or lower case.

If the physical-device is omitted, then the utility displays the current assignment for the specified logical device and I/O direction (that is Input or Output).

Note that the output of a logical device can be ASSIGNed to more than one physical device. (See the first example under the "Remote Console" section that follows.)

Examples of Use

Remote Console

Given a situation where a programmer, located remotely from the Onyx machine, wishes to "log in" to the machine via the modem port (which in turn is connected via a Modem to a phone line), then the local computer operator would enter the following command sequences :

    ASSIGN CONSOLE OUTPUT MODEM CONSOLE   or ASSIGN C O M C
    ASSIGN CONSOLE INPUT MODEM or ASSIGN C I M

From this point on, requests for console input would be satisfied by reading data from the modem port. Any output destined for the console would go to both the modem port and the local terminal so that the local operator could monitor the progress of the operation.

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If the modifications being made by the remote programmer are proprietary in nature, the remote programmer could enter a further command :

ASSIGN CONSOLE OUTPUT MODEM   or ASSIGN C O M

Thereafter, console output would go only to the Modem and not to the local terminal. Control of the machine could be restored to the local operator by the remote programmer typing :

ASSIGN CONSOLE OUTPUT CONSOLE   or ASSIGN C O C
ASSIGN CONSOLE INPUT CONSOLE   or ASSIGN C I C

CCREADY - Control-C ready

Purpose

This is a specialized utility that allows the user to take advantage of the "type-ahead" feature afforded by interrupt-driven input drivers.

The problem with type-ahead reveals itself when running a program such as Microsoft BASIC. This program recognizes certain control characters when they are entered from the keyboard – and for this reason the program incessantly monitors the keyboard status, checking to see if one of these control characters has indeed been entered.

The side-effect of this is that any characters that are not one of these special characters are summarily discarded!

The CCREADY program conditions the input drivers such that when a call is made to the Keyboard Status entry in the BIOS, the response "Data is waiting – a key has been pressed" is returned only when a Control-C has been entered. Other data characters are quietly accepted and placed in the terminal's type-ahead buffer.

However, an explicit request to read the next character from the keyboard will receive the first character from the type-ahead buffer.

The effect of invoking the CCREADY program lasts only until the next "warm-boot" of CP/M or, in the case of Microsoft BASIC, until the "SYSTEM" command is entered to return to CP/M.

Restrictions

Certain other products, such as Micropro's Wordmaster and Wordstar will not function properly if they are called immediately after CCREADY has been called.

How to call CCREADY

There are no parameters. Enter the command :

        CCREADY

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DO - Multiple Commands per Line Utility

Purpose

DO allows the user to enter several command lines on a single line. These commands are stored internally within the BIOS (Basic I/O System) and released to CP/M or any application program that solicits console, modem or serial printer port input.

How to use DO

The general format of a DO command line is :

        DO command 1\command 2\command 3\....

Backslashes (\) are used to separate the commands.

Examples of using DO

Take the case of wishing to list out the directories of drive B for both User 0, 1 and 3. Also given is the fact that the current default drive is C:.

A submit file cannot be used because :

        * It requires that drive A: be the current default disk drive.

        * As soon as the USER command is given, the SUBMIT file itself disappears from view.

Therefore, given that the file DO.COM is on drive B: in the current user's number, enter the command :

        do user 0\dir b:\user 1\dir b:\user 3\dir b:

The backslashes are converted into Carriage Returns. The commands will be fed into CP/M at the appropriate time.

As another example, given that a DDT must be used to make a patch to a test file, and then the test file saved away; enter the command :

```
do ddt test.com\ipatch.hex\r\s500\ff\|\save 100 test.com
                                      ^
                                  Control-C
```

Note the use of the vertical bar character ("¦"). This is translated by DO into a Control-C character.

Restrictions

The command tail (i.e. everything but the word DO) is converted into UPPER case by CP/M.

This command tail is stored in what is referred to internally as a "forced input" buffer. If an application program or CP/M itself makes an input request for data from any of the physical input devices (Console, Modem or Serial Printer Port) and if there is no incoming data but there is data in the forced input buffer, then a character will be retrieved from the forced input buffer.

A DO command line will only function when CP/M or an application program actually requests console input; therefore, DO commands embedded in SUBMIT files will not be executed unless they are the last commands of the submit file.

The DO command does not function with programs such as Microsoft BASIC (or an application program running under this BASIC). Microsoft BASIC "gobbles up" characters from the keyboard incessantly, looking for control characters that it recognizes. As such, the forced input buffer is quickly emptied and all the data discarded. However, a utility called CCREADY is provided. Calling this utility immediately prior to the Microsoft BASIC call will enable DO to function correctly. However, as soon as CP/M is re-booted (by entering the SYSTEM command to BASIC), the effect of CCREADY "wears off". A detailed discussion is provided in the description of CCREADY.

As an example of using CCREADY :

```
DO CCREADY\MBASIC PAYROLL\CCREADY\MBASIC FEDTAX
```

Note that in the example above, if PAYROLL automatically chains into FEDTAX without exiting from MBASIC, then the example would read :

```
DO CCREADY\MBASIC PAYROLL
```

That is, there would be no need to call CCREADY a second time.

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ERASEALL - Erase Logical Disk Directory

Purpose

ERASEALL allows the user to erase all files, for all user numbers, on the specified logical disk. Previously the only method for achieving this was to use a sequence of USER and ERA *.* commands.

How to use ERASEALL

The command line does not require parameters; enter :

        ERASEALL

The program then prompts :

        Enter logical disk for which directory is to be erased :

If the requested disk does not exist, ERASEALL displays :

        n is an illegal disk.

and repeats the original prompt.

If the user entered a valid disk, ERASEALL then prompts :

        About to erase all files on drive n
        Enter 'y' to proceed (anything else to restart)

If the user enters anything other than 'y', ERASEALL will display :

        Enter 'y' to proceed (anything else to restart)   <=== Not Erased!

and again request a disk letter.

If the user enters 'y' or 'Y', ERASEALL will complete the word by printing "es" and will immediately erase all files on the disk. This process will take no more than 10 seconds.

Finally, ERASEALL displays :

        All files on drive n erased.

and returns to CP/M.

FREEZE - System Configuration Save Utility

Purpose

After setting the system configuration using SPEED, ASSIGN and PROTOCOL, this utility allows the user to make the changes permanent; they will become the new defaults in force after the system is reset or powered-on.

How to use FREEZE

When all configuration options have been set as required, execute the following command :

```
FREEZE SYSTEM or freeze s
```

The parameter is required purely as a safety precaution. Omit it and FREEZE will only display helpful information on the Console.

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INITDSK1 - Initialize Physical Disk #1

Purpose

INITDSK1 <u>must</u> be used when installing CP/M onto a Double Disk configuration. It performs the functions of erasing the spare directory and the CP/M logical disk directories for the second daisy-chained drive.

How to use INITDSK1

No parameters are required; simply enter the command :

        INITDSK1

As a safety interlock, the utility requires confirmation that it is to erase the spare and logical disk directories on Physical Drive #1.

OPTIONS - Set System Options

Purpose

OPTIONS is a utility program that allows the user to specify certain system options; as such, it is a "catch-all" for those options that fail to fall into clear-cut categories as baud rates or peripheral assignments.

How to use OPTIONS

No parameters are required on the command line; simply enter :

        OPTIONS

The program will then present each available option and request a response from the keyboard.

Currently, the options are :

* The ability to enable or disable the display of the current user number each time that CP/M is "warm-booted"; that is, after each program called terminates.

* The ability to specify (in hex) the special characters used by the DO command to represent both Carriage Returns and Control-C. The release defaults are backslash (hex 5C) and "¦" (hex 7C) respectively.

Using the FREEZE Utility with OPTIONS

The options selected only remain in force until the next system reset or start-up. To make the selected options permanent, use the FREEZE utility; this will remove the need to rerun the OPTIONS utility.

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PROTOCOL - Device Protocol Utility

Purpose

The PROTOCOL utility allows the user to change the protocol used between the computer and a serial device; the purpose of this protocol is to set up a scheme whereby the CPU will not send data to a peripheral when the peripheral is not ready to receive it.

Description of Protocols

CP/M itself, over and above the protocol set with this utility, responds to the Xon/Xoff utility. This is imposed on all output that is initiated by the BDOS (Basic Disk Operating System) component of CP/M. However, output can also be sent by bypassing the BDOS and making calls directly on the BIOS (Basic I/O System); Microsoft BASIC is a case in point when it sends data to the printer. By doing this, the Xon/Xoff protocol afforded by the BDOS is bypassed. A driver-level protocol cannot be bypassed.

X-on/X-off Protocol

Before each character is output from the computer to the peripheral device, the driver checks to see whether there is any incoming data from the peripheral. If the incoming character is Xoff, no further output will be made to the peripheral until such time as a subsequent Xon character is input. When this happens, data output is resumed.

DTR Protocol

Before each character is output from the computer to the peripheral device, the driver checks to see whether pin 20 (DTR - Data Terminal Ready) on the 25-pin plug that connects the peripheral to the computer is at a positive voltage ("high"). If this is so, the data character will be sent; if DTR is low (pulled down by the peripheral), no output will be made to the peripheral until DTR again goes high.

ETX/ACK Protocol

This protocol is slightly more complicated than those described above. The concept of a specified message length is used. The actual value chosen is normally set to be half the peripheral's buffer size (the default is 127 decimal).

The output driver counts the number of characters sent to the peripheral; after the specified message length has been output, the driver sends an ETX (End of Text) character. It then waits for an ACK (Acknowledge) character to be sent back from the peripheral before any further data will be sent.

How to use PROTOCOL

Calling PROTOCOL by itself (that is, without any parameters), will cause it to display helpful information on the console. This information desribes the possible parameters that can be used with PROTOCOL.

The normal call is :

        PROTOCOL physical-device {protocol-type}

Where :
        *. physical-device is one of the following :

            - CONSOLE or TERMINAL
            - MODEM
            - SERIAL (the serial printer)

        Only the first character of the physical-device is used, and this can be entered in either upper or lower case.

    * Protocol-type is optional. If omitted, PROTOCOL will display the current protocol in force for the specified physical device. If specified, it can be one of the following :

            - NONE (only BDOS Xon/Xoff in force)
            - DTR
            - XON
            - ETX

        Again, only the first character is used and it can be entered in either upper or lower case.

Examples of using PROTOCOL

To enable output to the console only when DTR (pin 20) is high :

        PROTOCOL CONSOLE DTR or protocol c d

To check the current protocol in use with the Modem port :

        PROTOCOL MODEM or protocol m

Using the FREEZE Utility with PROTOCOL

The protocols set using this utility go into effect immediately, remaining in effect until the next time the system is reset. To make the protocol selection "permanent", use the FREEZE utility. This will then remove the need to set the protocols for the serial devices after each system reset or power-on.

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SPEED - Baud and Clock Tick Rate Utility

Purpose

SPEED allows the user to change the Baud Rates at which the Serial I/O devices operate and, in addition, to change the Real Time Clock "tick" rates.

SPEED can also be used to display the current baud rate for the Serial Devices or the tick rate for the clock.

How to call SPEED

Calling SPEED by itself (that is, without any parameters) causes it to display helpful information on the console. This information desribes the possible parameters that can be used with SPEED.

The normal call is :

        SPEED physical-device baud-rate

Where :

        * Physical-device is one of :

            - CONSOLE or TERMINAL
            - MODEM
            - SERIAL (the serial printer)
            - RTC (the Real Time Clock)

        Only the first character of the parameter is significant, and it may be entered in
        either upper or lower case.

        * Baud rate is one of the following :

            - 19200   (19)   <- Abbreviation
            - 9600   (9)
            - 4800   (4)
            - 2400   (2)
            - 1200   (12)
            - 600   (6)
            - 300   (3)
            - ?   (Causes current rate to be displayed)

For the real-time clock, the tick rate is a number in the range 1 to 60. It represents the number of 60th's of a second between each clock tick (and internal counter update). The normal value is 60, i.e. the clock ticks once a second. The real-time clock can be used as an interval timer by increasing the frequency of the tick rate, i.e. using a number less than 60. For example, by setting the count to 1, the real-time clock will tick every 1/60th of a second. See the description of the TIME utility for more information.

Using the FREEZE Utility with SPEED

The FREEZE utility can be used to make permanent the changes caused by SPEED. This removes the need to re-use SPEED after each system reset. SPEED actually makes two changes, firstly to change the current baud rate, and secondly to change the baud rate time constant used when the system is first brought up.

Examples of using SPEED

To set the baud rate of the Modem Port to 9600 :

        SPEED MODEM 9600 or speed m 9

To display the current baud rate setting for the Serial Printer :

        SPEED SERIAL ? or speed s ?

To set the Modem Port to 19200 baud, the real-time clock tick rate to once every 1/30th of a second and to display the current console baud rate :

        speed m 19 r 2 c ?   ...or
        SPEED MODEM 19200 RTC 2 CONSOLE ?

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Tape Archive Utility

ARCHIVE - Logical File Backup Utility

Purpose

The ARCHIVE Utility allows the user to copy individual files and sets of files to tape and to restore them to disk at a later time. This facility effectively gives the user an infinite amount of mass storage space.

The ARCHIVE facility treats file names in the same manner as CP/M. That is, file references may be unambiguous (in which case a single file is indicated) or the '?' and '*' characters may be used to refer to groups of files. In addition, a sequence number is associated with each file backed up, so that the ARCHIVE tape may contain several versions of the same file. Keyword parameters are available to allow manipulation of the latest version or to choose one file from among several with the same name.

NOTE. In the initial release of ARCHIVE the tape directory is kept in central memory when processing and, accordingly, is limited to 196 files.

How To Use The ARCHIVE Utility

The user may call the ARCHIVE Utility by typing :

        ARCHIVE

in which case the Utility will take all of its input from the console. Alternatively, the user may type :

        ARCHIVE filename

which will cause ARCHIVE to take its input from the file named on the input line. (Note that some prompts must still be answered interactively in this mode to preserve data integrity on tape and disk.)

In either event, if a semi-colon ";" is the first character of the input line, ARCHIVE treats the line as a comment.

Opening Dialogue

The opening dialogue is <u>always</u> conducted interactively, even when a file name was specified on the call to ARCHIVE.

After initializing its internal tables, ARCHIVE will prompt :

        Was this tape formatted with the TFORM command (Y/N)?

If the user responds with anything other than "Y", ARCHIVE will proceed directly to the tensioning prompt. A "Y" response will cause the tape header to be read. (NOTE. Attempting to read a tape that has never been formatted will cause unpredictable results.) If the header cannot be verified, ARCHIVE will display :

        Unrecognizable tape.   Proceed(Y/N)?

If the user responds "N", ARCHIVE will prompt :

        Load proper tape and type carriage return (or ^C to abort)

At this point the user may change tapes or abort. (NOTE. Do not change tapes at any other point while using the ARCHIVE utility.)

If the user answers "Y", ARCHIVE will proceed to the next prompt in the opening dialogue. In this case however, please note that the user must format the tape (using the command TFORM, described later) before it can be used.

If the label indicates that the tape was written by the ARCHIVE Utility, its contents are displayed as follows :

        TAPE NAME   SER#   FORMATTED   LAST UPDATED
         name   n   mm/dd/yy   hh:mm   mm/dd/yy   hh:mm
        Is this the correct tape(Y/N)?

Again, if the user responds "N", ARCHIVE will display :

        Load proper tape and type carriage return (or ^C to abort)

As before, the user may elect to change tapes or abort.

If the user responds "Y", ARCHIVE proceeds to the final prompt in the opening dialogue :

        Number of tensioning passes required(CR = 0)?

The user responds by entering the desired number of tape tensioning passes.

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The Commands

ARCHIVE indicates that it is ready for command input by displaying the prompt character "-". As mentioned previously, the ARCHIVE Utility will accept command input either from the console or from the file named as a parameter on the original call. (NOTE. If input is taken from a file, the commands are echoed to the console.)

In the following syntax table the braces "{}" indicate optional parameters which may be included or left out. The vertical bar "¦" indicates that one (and only one) of two options may be selected. Parameters not enclosed in braces are required.

The valid commands are :

* HELP - Prints out this list of commands.

* TFORM - Formats a new or re-formats an existing ARCHIVE tape by writing a valid header and an empty directory onto track zero.

* TDIR {filename} {LAST} - Similar to the DIR command in CP/M. Prints out all or part of the tape directory contents. TDIR with no parameters displays the directory entry for all files on the tape. TDIR filename displays all directory entries matching the (possibly ambiguous) file name. The LAST keyword is provided to display only the latest version of the requested file(s). Both parameters are optional. Either or both may be specified. Typing any key aborts the output of this command.

* FBACK filename - Backs up the file(s) matching the filename parameter from disk to tape. (NOTE. Public files on User 0 may only be backed up from User 0. The USER command is provided to move between user numbers.) A sequence number is maintained with each directory entry so that different versions of the same file may be referred to uniquely. The filename parameter is required on this command.

* FLOAD filename {LAST ¦ CHOOSE n} - loads the requested file(s) from tape to disk. If CHOOSE n is not specified, LAST is assumed. (That is, the latest version is loaded.) The CHOOSE option will cause loading of only the file(s) matching the (possibly ambiguous) filename parameter and having a sequence number equal to the n parameter.

  If the file being loaded exists on disk, ARCHIVE will prompt :

          filename exists on disk.   Overwrite(Y/N)?

  (NOTE. Public files on User 0 are always "visible" when loading files to alternate user numbers.)

  If the user responds "Y", the existing disk file will be lost (even if it is set to R/O status.) An "N" response causes ARCHIVE to prompt :

          New file name (CR = do not load file)?

  A carriage return at this point will abort the loading of the file. Alternatively, if the user enters a valid file name ARCHIVE will restore the tape copy under this name on disk (provided that it too does not already exist). ARCHIVE will repeat this prompt sequence until a non-existent name is

entered, or until the user elects to overwrite the file. During the operation, ARCHIVE displays the tape directory entry and disk file name for the file that it is loading.

* USER n ¦ ? - Allows the user to move to any valid user number (n option) or to determine the current user number (? option).

* TVFY - Verifies the integrity of the ARCHIVE tape by reading the header, the directory and every data block. (A data block contains 2048 bytes.) A bad block in the header or directory is very often fatal and means that the entire tape is corrupt. However, at the end of processing, ARCHIVE will re-write these areas if the tape has been altered (by the FBACK or TFORM commands). Thus, it is possible that a 'bad' tape could be made 'good' again. A bad block in a file means that that file alone is corrupt. If possible, take another backup of the file.

NOTE. For this command only, ARCHIVE will not be aborted if a fatal tape error occurs. It is therefore possible that the utility will hang in an endless loop, attempting to read a bad block. Should this occur, simply type ^C to abort. Remember though, if ARCHIVE is aborted, the tape header and directory are not re-written. Thus, any files backed up in the current run will be lost.

* END - Writes an updated header and directory to the tape (if a file has been backed up) and returns control to CP/M.

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Example ARCHIVE runs

The following example runs illustrate the various features of the ARCHIVE Utility. In all cases, input typed by the user is shown in lower case.

Example Number 1

This example illustrates a typical ARCHIVE run in which a new tape is tensioned and formatted, several files are backed up and the tape is verified.

```
A>archive

Tape Archive/Retrieval Facility.    Vn 1.0        08/01/80
Copyright (c) Johnson-Laird, Inc.

Has this tape been formatted with the TFORM command(Y/N)? n
Number of tensioning passes required (CR = 0) 3

-tdir
   Tape must be formatted before proceeding.

-tform
   New name for tape (8 chars)? archtape      ,
   Tape serial number? 1
   Format complete.

-fback ?80.com
   Backing up A:M80      .COM
   Backing up A:L80      .COM
   Backup complete.

-tdir
    FILE   NAME    SEQ #    DATE       TIME    BYTES
    L80    COM      1    08/06/80    15:21    10K
    M80    COM      1    08/06/80    15:22    18K
There are 2  directory entries.  194 entries available.

-tvfy
   Verify complete - no errors.

-end
```

(Tape Statistics are provided to monitor tape quality)

Error Type   [Recovery => Easy   Hard]

CRC Errors   0000   0000
Failed to detect data   0000   0000
Data but no synch char.   0000   0000
Waited too long for char.   0000   0000
Waited too long for CRC   0000   0000
Read-after-write data err. 0000   0000

ARCHIVE ended.

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(In the following examples, the Tape Statistics and signoff messages have been omitted.)

Example Number 2

This example illustrates a run in which the previously created ARCHIVE tape is used to re-load a file to the disk.

```
A>archive

Tape Archive/Retrieval Facility.    Vn 1.0    08/01/80
Copyright (c) Johnson-Laird, Inc.

Has this tape been formatted with the TFORM command(Y/N)? y
    TAPE NAME    SER#        FORMATTED        LAST UPDATED
    ARCHTAPE     1      08/06/80   14:51  08/06/80    15:7
Is this the correct tape(Y/N)? y
Number of tensioning passes required (CR = 0)?

-tdir *.com
    FILE  NAME    SEQ #    DATE      TIME     BYTES
    L80     COM    1    08/06/80    15:21    10K
    M80     COM    1    08/06/80    15:22    18K
There are 2  directory entries.  194 entries available.

-user 15
    Current user = 15.

-fload b:m80.com
    B:M80      .COM exists on disk.  Overwrite(Y/N)? n
    New file name (CR = do not load file)? b:newm80.com
    Loading    M80     COM    1    08/06/80    15:22    18K
        Disk file name is B:NEWM80    .COM
    Load complete.

-end
```

Example Number 3

This example illustrates ARCHIVE's ability to take command input from a file instead of the console. In the interest of clarity the contents of the input file ARCHINP are listed below :

```
;  See what's on the tape.
tdir *.dds
;  Restore COBOL data description statements.
;  Go to user 5.
user 5
;  Load all of the data description statements from the tape.
fload *.dds last
;  End of restore operation
end
```

Note that lines beginning with a semi-colon are taken as comments by ARCHIVE. Notice also that the opening dialogue must be answered interactively by the user, even though an input file has been specified.

```
A>archive archinp

Tape Archive/Retrieval Facility.    Vn 1.0    08/01/80
Copyright (c) Johnson, Laird, Inc.
Has this tape been formatted with the TFORM command(Y/N)? y
    TAPE NAME    SER#        FORMATTED        LAST UPDATED
     ARCHTAPE     1       08/06/80    14:51  08/06/80     15:7
Is this the correct tape(Y/N)? n
Load proper tape and type carriage return.

Has this tape been formatted with the TFORM command(Y/N)? y
    TAPE NAME    SER#        FORMATTED        LAST UPDATED
     OLDTAPE      2       07/23/80    10:23  08/03/80     23:30
Is this the correct tape(Y/N)? y
Number of tensioning passes required (CR = 0)?

-;  See what's on the tape.

-tdir *.dds
    FILE   NAME    SEQ #    DATE        TIME    BYTES
    CUSTMAST DDS    1     08/01/80    20:14     2 K
    CUSTMAST DDS    2     08/03/80    8 :31     2 K
    CUSTMF   DDS    1     08/01/80    20:13     10K
    TERMMF   DDS    1     08/01/80    20:13     26K
There are 19 directory entries.  177 entries available.
```

```
-;  Restore COBOL data description statements.

-;  Go to user 5.

-user 5
   Current user = 5.

-;  Load all of the data description statements from the tape.

-fload *.dds last
   Loading    CUSTMAST DDS    2    08/03/80    8 :31    2 K
      Disk file name is A:CUSTMAST DDS
   Loading    CUSTMF   DDS    1    08/01/80   20:13    10K
      Disk file name is A:CUSTMF   DDS
   Loading    TERMMF   DDS    1    08/01/80   20:13    26K
      Disk file name is A:TERMMF   DDS
   Load complete.

-;  End of restore operation.

-end
```

Disk Management Package

DDUMP - Dump Physical Disk Sectors

Purpose

DDUMP allows the user to display the physical (512 byte) disk sectors in HEX and ASCII format.

Using DDUMP

DDUMP is called with three parameters as follows :

```
DDUMP track sector count
```

The first parameter is the physical track from which to begin dumping. The second parameter is the physical sector within the requested track. If this parameter is greater than the total number of sectors on the track, the track is incremented and the sector decremented until a valid sector number is produced. The final parameter is the total number of physical sectors to dump and may exceed the number of sectors per track.

The following tables provide useful data about the physical/logical disks on the Onyx C8001 :

```
        For the 10Mb drive -
        Lowest track                    0
        Highest track                 353
        Sectors per track              54
        Start of directory A:   Track  10        Sector 0
        Start of directory B:   Track  58        Sector 0
        Start of directory C:   Track 206        Sector 0

        For the 18Mb drive -
        Lowest track                    0
        Highest track                 379
        Sectors per track              90
        Start of Directory A:   Track  10        Sector 0
        Start of Directory B:   Track  58        Sector 0
        Start of Directory C:   Track 218        Sector 0
```

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DSTAT - Display Map of Disk Usage

Purpose

DSTAT allows the user to determine the percentage of total disk space which is consumed by each user number.

How to Use DSTAT

The user calls DSTAT by typing :

        DSTAT {drive}

where {drive} is an optional drive letter (ie. A, B, etc.). If the parameter is omitted DSTAT will determine usage statistics for the entire mass storage system. If a drive letter is included, DSTAT will confine its determination to that logical drive. If the requested drive is not configured, DSTAT will display :

        Invalid drive requested.

and abort.

Upon completion, DSTAT will display the following map :

        Figures are approximate per cent of total disk space.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Free	Used
A:	51		1		9				1	1		12					25	74
B:	83		1	1	1				9							1	5	93
C:	21				17								3		1		56	42

(If a valid drive was requested, only the figures for that drive would be printed. The example above corresponds to the input line DSTAT with no parameter.)

NOTE - Since integer arithmetic is used, the percentages represent approximations only. In all probability, the individual numbers will not add up to exactly 100. As a further note, if any files exist on a user number, at least 1 percent will be printed for that user, even though the actual percentage may be less.

FCOMP - File Compare Utility

Purpose

FCOMP allows the user to perform a byte by byte comparison of the contents of two files.

How to use FCOMP

The user runs FCOMP by typing :

        FCOMP file1 file2

where file1 and file2 are unambiguous file references. If the utility is unable to locate either of the files, it will print the following message and abort :

        Error in opening file 'filename'.

If the files are successfully located, FCOMP begins the comparison. Whenever FCOMP encounters a byte within a record (128 byte CP/M sector) that differs between the two files, the corresponding records are displayed in the following format :

```
        Sector n (Extent n / Record n)
        File = filename1            File = filename2
O     : 2e 73 68 31 53 50 45 45 44 :  2e 73 68 30 53 10 45 45 40
                 ^^       ^^       ^^
8     : 44 20 2d 20 42 61 74 19 08 :  44 01 0d 0a 41 44 61 7f 0d
         ^^ ^^ ^^ ^^ ^^ ^^ ^^ ^^
16    : 20 21 20 20 41 41 20 44 31 :  20 21 20 20 41 41 20 44 31

        and so on....
```

The circumflex characters (^^) beneath the HEX bytes indicate the values which differ in the two files.

FDUMP - File Dump Utility

Purpose

FDUMP allows the user to dump the contents of a file in HEX and ASCII format.

How to Use FDUMP

The user runs FDUMP by typing :

        FDUMP filename

where filename is an unambiguous file reference. FDUMP will display the contents of the file in HEX and ASCII in a manner similar to the way DDT displays memory.

FINDALL - Disk Search Utility

Purpose

FINDALL allows the user to search the entire disk for a particular file.

How to use FINDALL

To search for a file, type :

        FINDALL filename

The filename may, of course, be ambiguous. When the file is located, a map of the following format is printed :

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A:	*										*					
B:			*									*				
C:					*	*	*									

showing asterisks in all user numbers containing files matching the requested filename.

If the file is not found on the disk, the message :

        File not found.

is displayed.

The user may optionally restrict the search to a single logical disk by specifying the filename as follows :

        FINDALL b:filename

In this case, the map (and the search time) is abbreviated :

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B:			*									*				

FINDALL is not affected by the status (public or private) of the files on User 0.

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INVIS - Move File(s) to User 0 and Set SYS and R/O Status

Purpose

INVIS is designed specifically to aid users who wish to take advantage of the 'Public Files on User 0' facility of CP/M 2.2.1.

How to Use INVIS

The user calls INVIS by typing :

        INVIS filename {user}

where filename is a (possibly ambiguous) file reference and user is the user number from which to move the file. If the user parameter is omitted, INVIS searches the directory of the current user number for the named file(s).

When converting to public files on User 0, the user need only type :

        FINDALL *.COM

and, using the map that is produced by this utility, type :

        INVIS *.COM user

for each user that contains a .COM file (taking care to insure that file names will be unique on User 0). The result will be to move (again it is stressed, without copying!) the file(s) to User 0 and to set them all to SYS and R/O status. Typing :

        PUB

will enable public files and the conversion is complete.

MOVEF - Move File(s) between Users

Purpose

MOVEF allows the user to change the residence of a file from one user number to another without copying it.

How to use MOVEF

The user calls MOVEF by typing :

```
MOVEF filename destination {source}
```

The filename may be ambiguous, in which case all files matching the filename mask will be moved. The destination is the user number to which the file(s) will be moved. The source is an optional parameter and represents the user number from which the file(s) will be moved. If this parameter is omitted, MOVEF will search the directory of the current user number for the named file(s).

QERA - Query User and Erase File(s) Utility

Purpose

QERA allows the user to erase files but, unlike the ERA command under CP/M, the utility displays each file name before erasure and prompts the user to erase or retain the file.

How to use QERA

The user calls QERA by typing :

```
QERA filename
```

where filename is a (possibly ambiguous) file reference preceded by an optional drive specification. QERA will scan the proper directory and, for each file encountered that matches the parameter, will display :

```
Erase file name     .ext ?
```

If the user responds 'y', QERA will erase the file and print '<=== Erased.' to the right of the response. If the user responds 'n', QERA will print '<=== Not erased.' and proceed to the next file.

If the requested file is not found, QERA displays :

```
File not found.
```

and aborts.

UNERA - File Recovery Utility

Purpose

The UNERA utility allows the user to recover the contents of a file which was inadvertently ERAsed.

How to run UNERA

When the user types :

        ERA filename

CP/M writes the hex character 'E5' in the first byte of each directory entry for the file(s). Until a warm boot is performed, the in-memory allocation vector is not altered. Thus, the UNERA utility simply resets this byte to the current user number (as it was before the 'E5' character was written) and recovers the file. Type :

        UNERA filename

where filename is a (possibly ambiguous) file name, and the file will be recovered.

NOTE - If a warm boot is performed between the ERA command and the UNERA command, it is possible that the directory will be corrupted.

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VIS - Remove SYS and R/O Status From File(s)

Purpose

When it becomes necessary to copy a file with PIP, the file must be set to DIR status. (See the CP/M 2.0 documentation on STAT for an explanation of DIR status.) Also, in order to ERAse it, the file must be set to Read-Write (R/W) status. VIS has been provided to accomplish this task simply.

How to use the VIS utility.

To call the VIS utility, type :

          VIS filename {user}

where filename is the (possibly ambiguous) file reference and user is the user number which the utility is to search for the file(s). If the user parameter is omitted, VIS will search the directory of the current user number.

If the file is found, DIR and R/W status will be set.

Appendix A. Summary of Commands in CP/M 2.2.1 and Utility Programs

COMMAND	Command Description	Program Package	Page
ARCHIVE	Logical File Backup Utility	Tape Archive	59
ASSIGN	Peripheral Assignment	Enhanced Release	45
BASDL	BASIC Program to Transmit Files	Standard Release	21, Append B
CCREADY	Control-C Ready	Enhanced Release	48
DATE	Set/Display System Date	Standard Release	23
DBACK	Logical Disk Backup to Tape	Standard Release	24
DDUMP	Dump Physical Disk Sectors	Disk Management	68
DLOAD	Logical Disk Load from Tape	Standard Release	26
DO	Multiple Commands per Line	Enhanced Release	49
DSTAT	Disk Usage Display	Disk Management	69
DVFY	Verify Disk Backup Tape	Standard Release	28
END	End ARCHIVE Processing	Tape Archive	62
ERASEALL	Erase Logical Disk Directory	Enhanced Release	51
FBACK	Backup File to Archive Tape	Tape Archive	61
FCOMP	File Comparison	Disk Management	70
FDUMP	File Dump	Disk Management	71
FINDALL	Disk Search	Disk Management	72
FLOAD	Reload File to Disk	Tape Archive	61
FREEZE	Save System Configuration	Enhanced Release	52
HELP	Print ARCHIVE Command Syntax	Tape Archive	61
HLOAD	Load Housekeeper Tape	Standard Release	29
INITDSK1	Initialize Physical Disk #1	Enhanced Release	53
INVIS	Set User 0 Files to SYS and R/O	Disk Management	73
LOADREL	Load Software Release Tape	Standard Release	31
MOVEF	Move Files between Users	Disk Management	74
OPTIONS	Set System Options	Enhanced Release	54
PATCH	System Patch	Standard Release	33
PIPRX	Send ASCII Files	Standard Release	21,42
PRIV	Disable Public Files on User 0	Standard Release	34
PROTOCOL	Change Serial Device Protocol	Enhanced Release	55
PUB	Enable Public Files on User 0	Standard Release	34
QERA	Query User to Erase Files	Disk Management	75
RX	Receive Data Files	Standard Release	45
SPARE	List Spare Directory	Standard Release	35
SPEED	Change Baud Rate on Serial Device	Enhanced Release	57
TDIR	List Archive Tape Directory	Tape Archive	61
TFORM	Format Archive Tape	Tape Archive	61
TIME	Set/Display System Time	Standard Release	36
TVFY	Verify Integrity of Archive Tape	Tape Archive	62
TX	Transmit Data Files	Standard Release	42
TX/RX	Inter-system Communication	Standard Release	38
UNERA	Recover File	Disk Management	76
USER	Current User Number in ARCHIVE	Tape Archive	62
VIS	Remove SYS and R/O Status	Disk Management	77

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Appendix B. BASDL - An Example BASIC Program to Transmit Files

The following is a listing of the program BASDL.BAS written in Microsoft BASIC. It is included in the Standard Release of CP/M 2.21 for the Onyx C8001 to show how to send data to PIPRX.

BASDL normally would execute in the system sending data to the Onyx. See Downloading Source Code from Other Machines on Page 22 for more information on how to download files to the Onyx.

```
10 REM EXAMPLE PROGRAM WRITTEN TO EXECUTE IN THE SOURCE MACHINE
20 REM THIS PROGRAM IS DESIGNED TO COMMUNICATE WITH PIPRX IN THE C8000
30 REM START UP PIPRX WITH THE COMMAND :
40 REM            PIPRX <FILENAME>=INP:[BE]
50 REM THEN START UP THIS PROGRAM AND DOWNLOADING WILL OCCUR.
60 REM THIS PROGRAM CAN ONLY BE USED TO DOWNLOAD ASCII FILES
70 REM (I.E. NOT REPEAT NOT FILES OF TYPE .COM)
80 CLEAR 1000
90 LINE INPUT "ENTER FILE NAME (<DN>:<FILENAME>.<TYP>) ";FI$
100 OPEN"I",1,FI$
110 IF EOF(1) THEN LPRINT CHR$(26) : PRINT CHR$(7);"FILE SENT" : CLOSE :
        GOTO 80
120 LINE INPUT #1,L$
130 I=I+1
140 IF I<500 THEN GOTO 190
150 I=0
160 LPRINT CHR$(19);
170 FOR J=1 TO 2000
180 NEXT J
190 LPRINT L$
200 GOTO 110
```

Appendix C. Converting to 18M byte Drivers

Purpose

This appendix is included for those users who have been running their 18M byte drive(s) with 10M byte software (drivers.) This encompasses everyone who has been running CP/M on an Onyx C8001 equipped with 18M byte drive(s) (model 7720.)

Problems Associated With Upgrading

If an 18M byte version of CP/M is booted up on a system which previously treated the disk as though it contained only 10M bytes (that is, as a model 7710), all data on the disk will be corrupt. (The user is cautioned that this may not appear to be the case. For instance, a DIR on drive A: may show the files to be intact when in fact, they are not!) For this reason, the following procedure must be followed by those users installing the 18M byte version of CP/M 2.21.

10 to 18M Byte Upgrade Procedure.

1 Using the Housekeeper, back up the entire "E:" disk.

2 Following the procedure outlined in the CP/M on the C8001 User's guide, install the 18M byte Software Distribution Tape. Be sure to indicate that this is an initial installation so that the spare directory is cleared.

3 Boot up the 18M byte system and erase all files from all user numbers on logical B: and C: drives. (Purchasers of the Enhanced Release may use the ERASEALL Utility to accomplish this.)

4 Use the new HLOAD Utility to reload the B: and C: drives from the Housekeeper backup tape created in step 1 above.

5 Use PIP to move all files from drive A: to B: or C:.

6 Use the HLOAD Utility once again to reload drive A: from the backup tape created in step 1.

7 Now use PIP to move the files back onto drive A:, reversing the effect of step 5.

8 Finally, use the new DBACK Utility to take a backup of the entire system. (This will require running DBACK twice, as the entire 18M byte system can not be held by one tape cartridge.)

The entire 18M bytes of hard disk storage are now available for use under CP/M.

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.

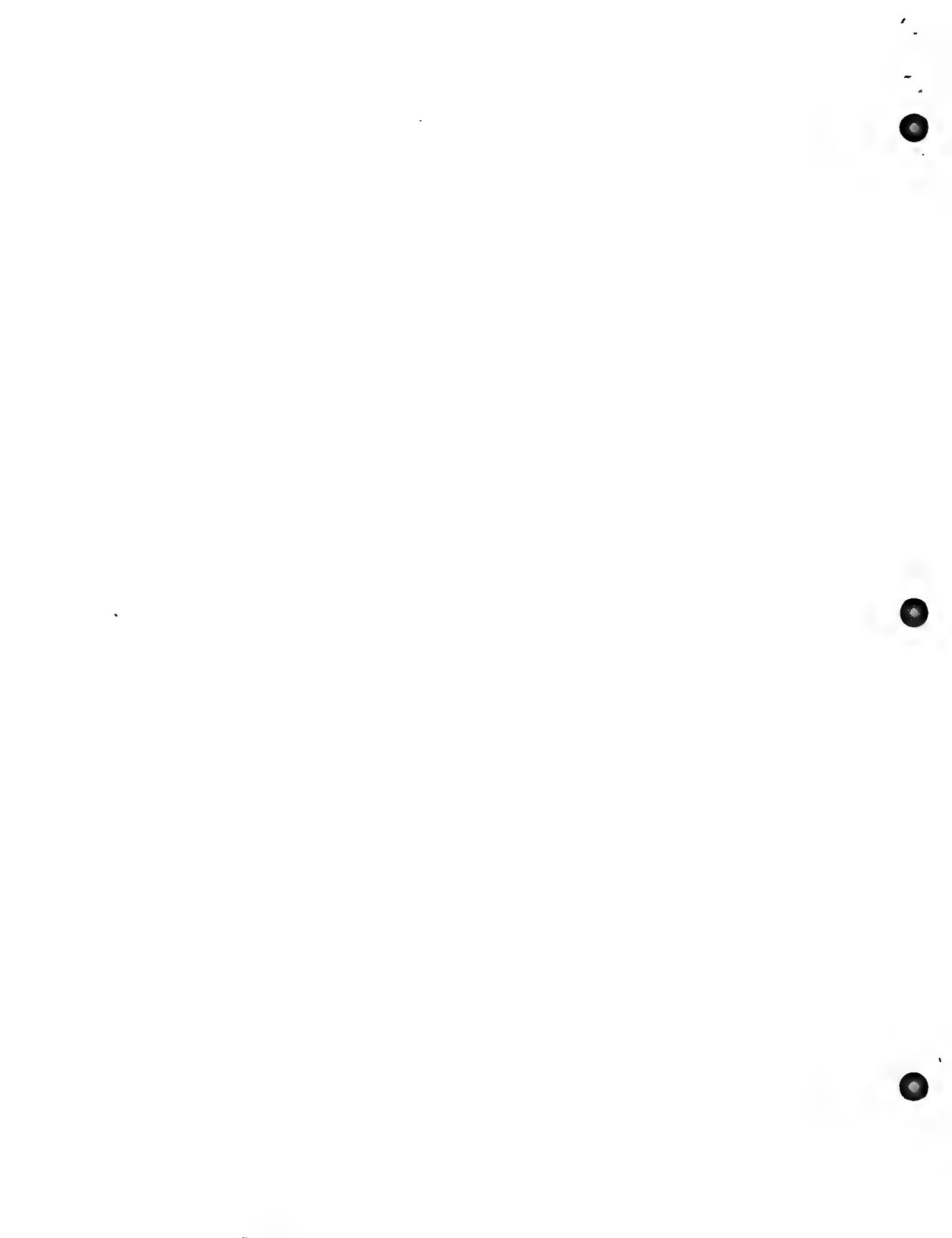### Appendix D. Order, Update and Software Problem Report (SPR) Forms

The following forms are included in this manual for the convenience of the user in ordering upgrades, utility programs and in reporting errors and software problems :

1. Order Form

2 Update Voucher Form

3. Reader Comment Form

4. Software Problem Report Forms (2)

Update Voucher for CP/M 2.

Valid for upgrading CP/M 2.2.1, Serial # J-L 20 2-149-0 _149_ to next release level.

This voucher is to be returned at the time of the next release to the address given on this form, along with the original release Tape Cartridge on which the previous version of CP/M was received.

The new release will be written onto this tape and returned to the registered user specified below. Shipment will be made to the user by UPS service or Air Mail for users outside the United States. Users will have been advised of the costs at the time that the new release was announced.

Please enter the mailing address to which the Tape Cartridge should be returned:

Name : _____

Address : _____
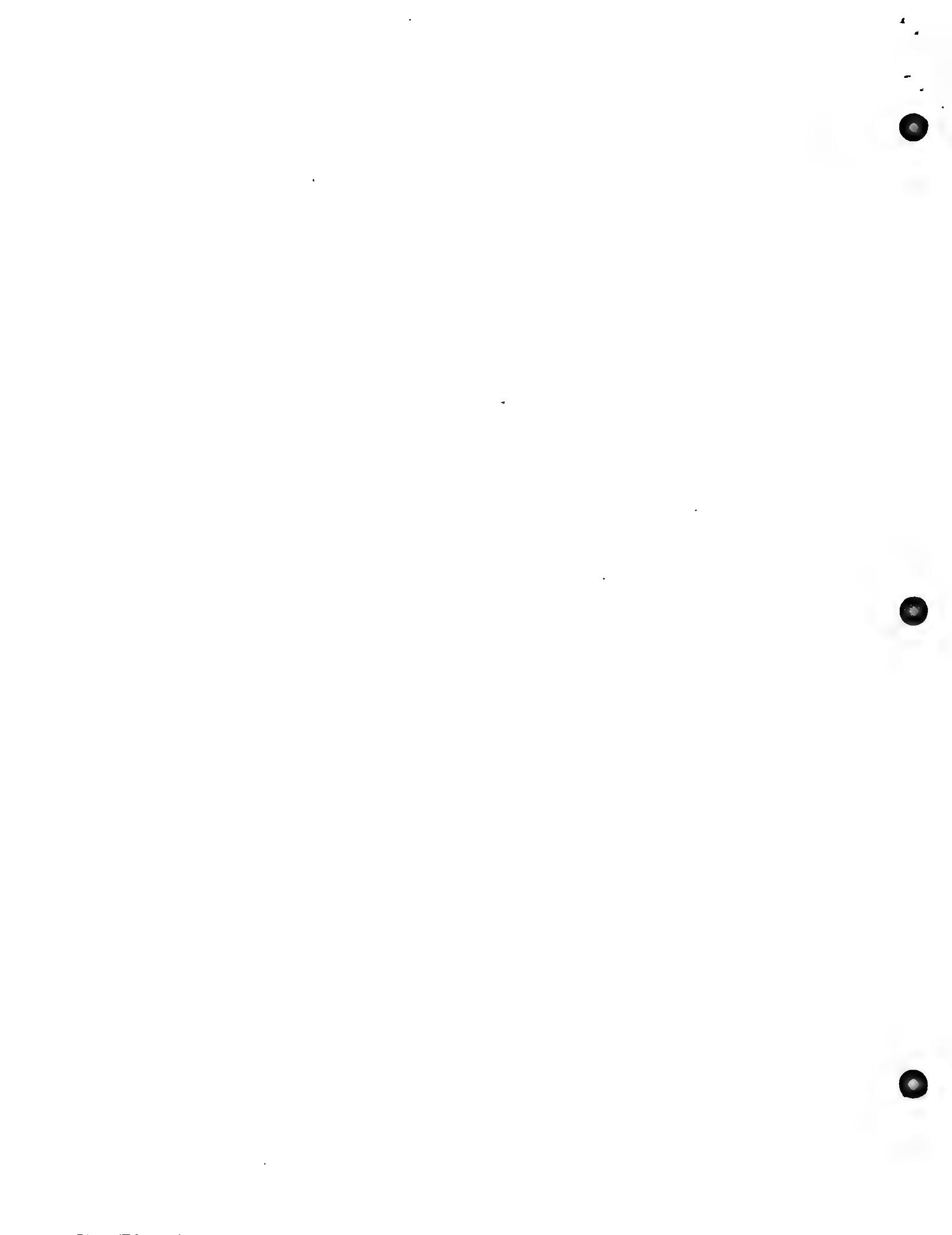
City : _____

State/Zip : _____   _____

Phone : (_____)_____

Date : _____

Authorizing Signature : _____

JOHNSON-LAIRD, INC. 1556 SW 66TH PORTLAND, OREGON 97225 (503) 292-6330

ORDER FORM

CP/M Serial # (Required on every order):   J-L 2.0 2-149-0_____

Check Type of Disk in C8001:   _____ 10Mbyte   or   _____ 18Mbyte

Package	Price	Total
Standard Upgrade (See Note Below)	$ 30.00	_____
Enhanced Upgrade (See Note Below)	$ 80.00	_____
ARCHIVE Utility	$200.00	_____
Disk Management Package	$150.00	_____
Tape Management Package	$175.00	_____
BDS 'C' libraries:		
Disk interface library	$ 75.00	_____
Tape interface library (w/ TMP)	$ 75.00	_____
CP/M Handbook by Rodnay Zaks	$ 12.95	_____
Media Charge		
(if previous tape not returned)	$ 30.00	_____
	Total remitted:	_____

COMPANY NAME: _____

YOUR NAME: _____

ADDRESS: _____

CITY,STATE,ZIP   _____

PHONE   (_____) _____-_____

Make all checks payable to: JOHNSON-LAIRD, INC.
1556 SW 66th AVENUE
PORTLAND, OREGON 97225

Checks must accompany order unless prior arrangements have been made.

NOTE:

1. Users having the ENHANCED RELEASE of CP/M 2.2.0 will automatically receive an upgrade containing all the Enhanced utilities with their order for a Standard upgrade of CP/M 2.2.1 @ $30.00.

2. Users with the STANDARD RELEASE of CP/M 2.2.0 who order an Upgrade to CP/M 2.2.1 and, at the same time, would like to get the Enhanced Utilities should order an Enhanced Upgrade @ $80.00.

We invite Users to use this form to report errors found in the User's Guide for CP/M 2.2.1 on the Onyx C8001. We would also appreciate receiving your comments on the usefulness, readability and organization of the manual, as well as any suggestions for changes or additions.

Use the Software Problem Report (SPR) forms enclosed on the following pages to report problems and bugs found with the software.

Write your comments below, indicating page numbers where appropriate or attach copies of pages marked with your suggestions.

For your convenience, this form is self-addressed.

COMMENTS:

NAME:

COMPANY:

ADDRESS:

CITY/ZIP:

TELEPHONE:

DATE:

Fold into thirds and staple closed. (Address on back).

TO: JOHNSON-LAIRD, INC.
      1556 SW 66th Avenue
      Portland, OR 97225